RAILROAD GAZETTE

FRIDAY, JULY 12, 1878.

Saxby & Farmer's Signalling Apparatus at the Paris Exhibition.

Comparatively few railroad managers in this country have any idea of the perfection to which the fixed signals for running trains have been developed in Europe. Some of the simplest and most effective appliances, which are almost universally used there, are comparatively unknown here. It will be quite safe to say that a majority of railroad superintendents here do not even know what a semaphore signal is, and its use is confined to a very few Eastern roads, if we except some very awkward and cumbrous forms of it which are used in some places at junctions or draw-bridges. Nothing is more common either than for experienced railroad men to confuse the interlocking system of switches and signals with what is called the block system of running trains. It will, therefore, be difficult to describe the signalling apparatus which is exhibited at the Paris Exhibition by Messrs. Saxby & Farmer, and which is illustrated herewith, so that the description will be understood without first giving a little preliminary explanation of the principles of the interlocking and block systems.

The interlocking system of switches and signals is used only in connection with switches at stations, junctions, etc., and has nothing to do with the movement of trains between stations. The block system, on the other hand, is used to prevent more than one train from occupying a given space *between stations* at the same time, and has nothing to do with the switches.

Thus, to illustrate the principles of the interlocking system, let it be supposed that there is a station, *B*, fig. 1, on a double-track road, with a number of turn-outs and switches, such as 7, 7, 5 and 8. Now suppose that a local freight train has reached station B, and that it is necessary to set out a number of cars on "siding 8." The train is therefore run up to the left of the station beyond the switch 8, and is then backed into the turn-out 8, 8. It is plain that if, while the freight train is occupying or "fouling" the crossing of the up and down lines at *m*, an express train should approach station *B* on the "up" line, a collision might occur at *m*. To avoid the possibility of this, all the switches at *B* are arranged so as to be worked by levers placed in a cabin *B*, and such mechanical appliances are used* that it is impossible to move the switch 8 without *first* lowering the signals 1 and 2 to danger, and thus warning the approaching trains. All the other tracks and switches are protected in a similar way. This, in some cases, becomes very complicated, but a fuller explanation here would be out of place. The general principle will be understood from what has been said.

With the block system a train is not allowed to leave station *A* until the signalman at *A* learns from the signalman at *B* that the preceding train has reached *B*, or that the "line is clear" between *A* and *B*. Although with the interlocking apparatus it is impossible to move switch 8 without placing the signals 1 and 2 at danger, yet with the ordinary appliances it would be possible, through inadvertence, or other of the many causes of human error, to telegraph "Line Clear" when the switch is set for the turn-out, and the signals are at danger. In such a case the train would be stopped in time if the locomotive runner observed the danger signals, but in such cases there exists a chance that the train will not be stopped in time, and serious accidents have been caused in this way, through the error, omission, or misapprehension of telegraphic communication between telegraph stations.

The object of the apparatus which is illustrated herewith and which is exhibited at Paris, is, as stated in Messrs. Saxby & Farmer's circular:

1. "To make it impossible for the signalman to telegraph 'Line Clear' until the switches and outdoor signals are in the proper position.

2. "To make it impossible to move the switches for shunting or giving access to a line which has been signalled as 'Clear' for an expected train, nor in any case can such movement of the switches be made until *after* the 'Line Blocked' signal has been sent to the station on either or both sides.

3. "The signal 'Train on Line' must be transmitted to the station in advance before the outdoor signal for a train to enter a block section can be given, so that it is not possible for a train to enter a block section unannounced by telegraph to the station in advance.

4. "The outdoor starting signal cannot be given to permit entrance into a block section without the consent and concurrent action of the signalmen at both ends of such block section.

5. "The mechanism makes it compulsory that the outdoor starting signal should be reset to danger behind every train, and that upon the entrance of a train into a block section, the signalman at the station in advance shall give to the signalman at the station in the rear the proper signal of 'Line Blocked' behind the coming train."

The mechanism to acomplish these results is described as follows in *Engineering* of May 24, to which we are also indebted for the engravings figs. 2 and 3:

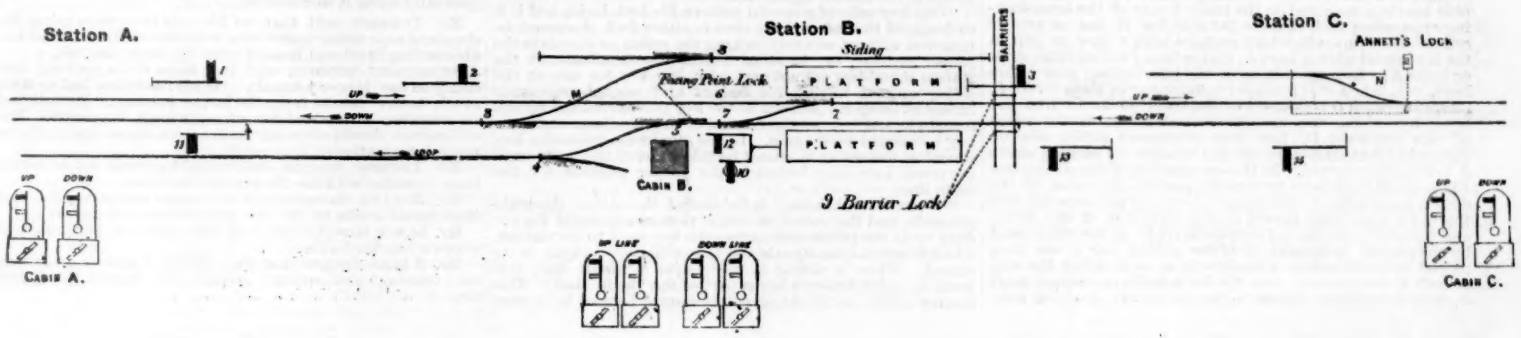

Fig. 1.

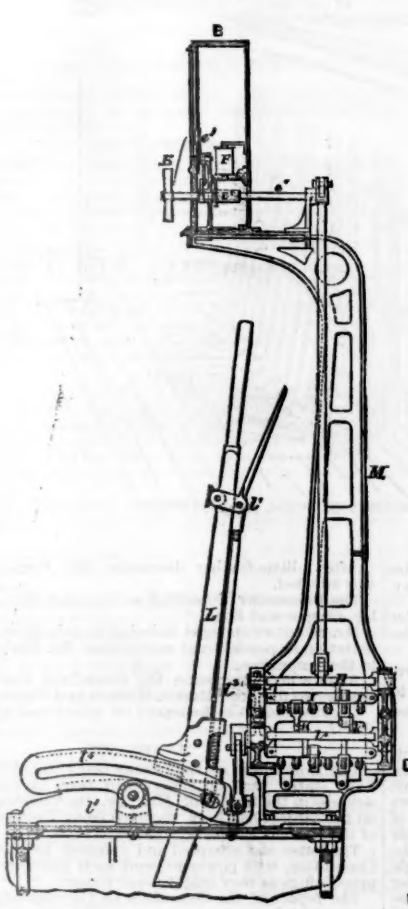

Fig. 2.

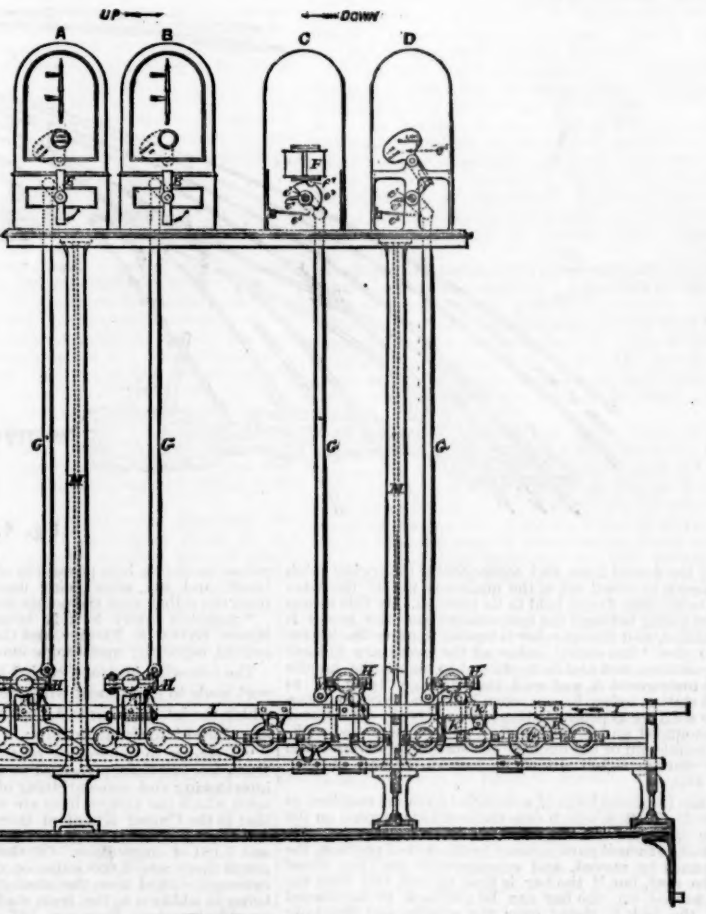

Fig. 3.

"The accompanying engravings, illustrative of the system, represent an interlocking apparatus consisting of fourteen points and signal levers combined with four electric telegraph signaling instruments, two for the up and two for the down line of railway as exhibited by Messrs. Saxby and Farmer in the Paris Exhibition. Fig. 1 represents a transverse section through the lever frame with one of the levers *L* in its normal position, the interlocking of the levers is that known as the 'preliminary action of locking gear,' wherein the interlocking is effected by means of the movement of the spring catches of the levers. Fig. 2 represents a front view, partly in section, the fourteen levers being removed for convenience of representation; in this figure the exterior of two of the instruments is shown and the interior of the two others.

"On the framing *M* is mounted at a convenient level for the eye and hand of the operator, a pair of electrical block instruments *A* and *B* for the up line, and a pair *C D* for the down line of railway; each of these instruments is provided with a vertical rod or spindle *G*, worked by means of a horizontal spindle e^1, attached to the handle *E*; connected to and worked with the cross spindle e^1 is the dial plate e^3 having written upon it the words 'line clear,' 'line blocked,' or 'train on,' as the case may be, these dial plates working with the handles *E* are moved backward and forward behind suitable openings in the face of the electrical instruments, and thus indicate clearly to the operator the message he is sending to the distant station. On the upper portion

* These were very fully described in the *Railroad Gazette* of Oct. 13 and 20, 1876.

of each instrument there is a miniature semaphore signal, the upper arm being worked from the adjacent station, and the lower arm operated electrically by the movement of the handle *E*, thus indicating to the operator that the action of his electrial apparatus coincides with the mechanical action of the handles *E*, and the dial-plate attached thereto. Connected to the spindles e^1 are insulated crosspieces of metal e^4, which when the handles *E* are turned are brought to bear upon the springs e^5, and thus electrical contact is made, and the necessary signal is transmitted to the distant station.

"The two instruments *B* and *C* have in addition to this a plate e^3 attached to the cross spindle e^1; on the upper edge of this plate is a notch for receiving the detent f^1 which is suspended between the plate e^3 and a pair of electro-magnets *F*; these magnets are connected to the instruments at the distant station. When the handle *E* is turned the detent f^1 falls into the notch on the edge of the plate e^3, and thus locks it and prevents the handle being turned so as to make contact or set free the locking; but when from the next station an electrical current is transmitted through the coils of the electro-magnets *F*, the detent f^1 is held up, and does not fall into the notch in the edge of the plate e^3; consequently no obstruction is presented to the full movement of the handle *E*. Each of the rods *G* is connected at its lower extremity to a flat spindle or rocking shaft *H*, working in suitable bearings mounted on the main frame of the lever-locking apparatus; each of these flat spindles *H* has an arm or crank formed upon it, which engages with a jaw or gab on the horizontal sliding bars *I*. On the bars *I* are suitable stops or locks *K*, which operate upon the interlocking gear as follows, viz., when it is intended to move one of these levers *L*, its spring catch l^1 is grasped by the hand so as to free the lever by raising the end of the rod l^2 out of the notch of the quadrant l^3, but this movement acting also on the rocker l^4 causes one of the flat spindles or rocking shafts l^5 to be partly turned. In the one position of the sliding bar *I* this spindle is free to turn to the position indicated by the dotted lines in fig. 2, but being so turned it prevents the sliding bar *I* from being moved in the direction of the arrow and thereby locks the rod or spindle *G*; if on the other hand by the partial movement of *G* the sliding bar *I* has been moved in the direction of the arrow, so as to bring the stop or lock *K* immediately over the flat spindle or rocking shaft l^5, then this spindle cannot be turned to the position indicated by the dotted lines, and consequently the spring catch rod l^2 cannot be raised out of the quadrant notch, the main lever *L* being thus firmly held in its position. By this means the interlocking between the instruments and the levers is accomplished, and the operator is unable to move the instruments to give 'line clear,' unless all the levers are in their proper positions, and also he is obliged to move the handle *E* of the instrument *B*, and send the message 'train on' to the next station before he can move his signal lever to give a signal to a driver to proceed; therefore no train can be sent on unannounced, and as the handle *E* cannot be moved without the permission of the man at the station in advance, the out-door starting signal cannot be moved without his permission also.

"In some instances locks of a modified form are required as shown at k^1, fig. 2, in which case the lock k^1 is pivoted on the slide bar *I*, the result being, that if the spindle below this special lock is turned partly round to the dotted position, the bar *I* cannot be moved, and consequently the 'line clear' cannot be sent, but if the bar is first moved, and then the spindle turned up, the bar can be put back to its normal position, the lock K^1 rising over the spindle, and dropping over it so that the bar *I* cannot be moved again until the spindle has been put back to the horizontal position; by this means it is made compulsory for the starting signal to be put to danger before 'line clear' can again be given to the station in the rear.

"In order to understand the mode of working the apparatus, we will suppose a warning received on the electric bell (which bells are not shown in the illustration as they may be quite of the usual type) that a train wants to approach, the signalman must first place all his levers in their proper position (if they are not already so), and then, and not till then, can be sent the message 'line clear' to the rear station, which he does by turning round the handle *E* of the instrument *A;* having done this his levers become locked. Then the message 'train coming' is sent to him by means of the small semaphore arm on the upper portion of the instrument *A;* it is now his duty to warn the signalman at the next station in advance, by means of the bell, of the coming train, and in reply, if all is right, he will receive the message 'line clear' by the lowering of the small semaphore arm on the instrument *B;* now the handle *E* of the instrument *B* should be turned, unlocking the starting signal lever, which can then be lowered for the train to proceed.

"The locking is also so arranged that the handle *E* of the instrument *A* must be returned to its normal position of 'line blocked' before the handle of the announcing instrument *B* can be turned; consequently 'line blocked' must be sent to the rear station before the starting signal can be taken off for the train to proceed to the next, and until the starting signal is returned to the danger position, the handle of the instrument *A* cannot be turned to send 'line clear;' this insures the starting signal being put to danger behind every train. The mode of working the instruments *C* and *D* for the down line is of course precisely similar to that described for the up line. The locking combinations may be varied to suit any mode of block-working, or any kind of telegraph instruments or interlocking apparatus."

Another signalling device which has been introduced by Messrs. Saxby & Farmer is described as follows by a correspondent of the *English Mechanic*, from which we have copied the engraving fig. 4:

"It frequently happens that outlying sidings [as *n*, fig. 1] are made which have not enough traffic to require a signalman to be stationed at them, and yet are situated at too great a distance from the station signal-box to be worked and interlocked with the signals in the ordinary manner. To extend the security of the interlocking system to outlying siding points, Annett's safety lock has been invented. The [perspective] drawing [fig. 4] shows a siding in communication with the down main line.

"Both the 'main line' and the 'safety' or 'leading' points are connected by rods to a single lever fixed in a frame by the side of the line, and fitted with an Annett's safety lock. A duplicate lock is also fitted to the 'down main line' signal levers in the station signal-box.

"One key only of a special pattern fits both locks, and it is so designed that after being used in either lock it cannot be removed without securely locking the points or signals in the proper position, or, in other words, the signalman at the station signal-box cannot part with the key for use at the siding without having his distant and semaphore signals locked at danger. As soon as the key is removed the signals remain locked beyond the control of the signalman until the key is brought back again. In the same way, when the key is used at the siding it cannot be taken out of the lock until the points have been locked in the proper position for the main line.

"When the 'shunting' is finished at the siding the train proceeds, and the porter or other person appointed for the duty locks the points and carries the key back to the station, when it unlocks the signals and the ordinary working is resumed. When a siding is made upon a 'single line,' it is usual to make Annett's key a part of the 'train staff.' This insures safety, as the siding points cannot be used by a train unless the driver is in possession of the 'train staff' and the 'staff' and key, after being used cannot be taken away from the siding until the points are securely locked.

"Annett's safety lock is being largely introduced by Messrs. Saxby & Farmer, and the practical working of the system, especially upon single lines, is most satisfactory."

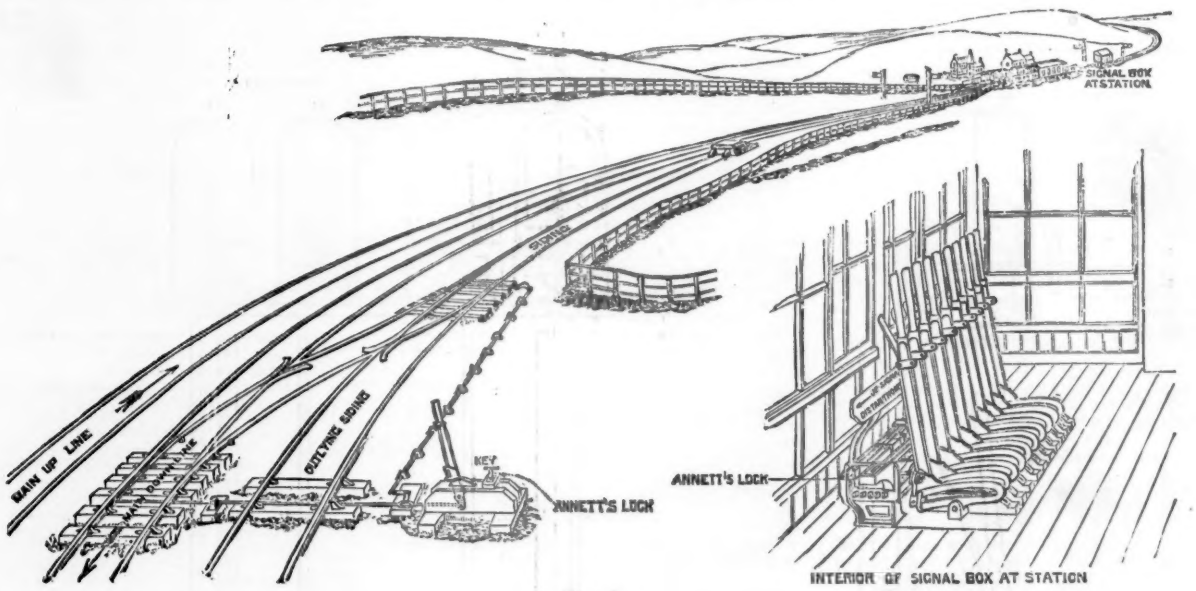

Fig. 4.

The following abstract, copied from an exchange, of a report made to Parliament will give some idea of the extent to which the interlocking and block system of signals have been introduced into Great Britain:

"A return, in pursuance of the railway regulation act, 1873, has just been presented to Parliament, relative to the interlocking and concentrating of signals, and the systems upon which the various lines are worked. This return shows that in the United Kingdom there is now a total length of railway open for passenger traffic of 8,980 miles of double and 7,181 of single lines. Of the distance worked by telegraph there are 6,659 miles of double and 3,059 of single railways worked upon the absolute block system, the latter being in addition to the train staff system. On the permissive block system there are 167 miles of double and 29 of single lines at work. The distance worked by telegraph, but not on either of the foregoing systems, is 506 miles of double and 477 of single lines. Of these, 337 miles are worked on the system in which only one engine in steam, or two or more engines coupled together, are allowed to be upon the line at one and the same time. Between five and six miles are operated by the train porter system and 3,211 by the train staff system. By a comparative statement included in the return, it appears that in 1876 the length of double line open in the United Kingdom was 8,885 miles, as compared with 8,980 in 1877, and the distance worked on the absolute block system increased from 6,290 miles in 1876 to 6,660 in 1877. The percentage of double lines worked by the absolute block system showing an increase from 71 per cent. in 1876 to 74 per cent. in 1877."

MASTER MECHANICS' ASSOCIATION.

Discussions at the Eleventh Annual Convention.

We have heretofore given a sufficient summary of the first day's proceedings of the convention at Richmond, and have published most of the committee reports in full. We now add a summary of the further discussions, condensed from the stenographer's report.

SECOND DAY'S PROCEEDINGS.

After the opening of the convention, the report of the Committee on Wheels and Axles, which was published in the *Railroad Gazette* of May 17 (page 241), came up for further discussion.

WHEELS AND AXLES.

Mr. FORNEY spoke of the great importance of establishing a standard axle, and referred to the action heretofore taken by the Master Car-Builders' Association. He moved that a committee of three be appointed to confer with the Master Car-Builders' Committee on a standard axle for cars and tenders.

Mr. WELLS moved to amend by striking out reference to the Master Car-Builders' Association. He wanted the committee to recommend a standard axle for tenders, but did not wish to confine them to the Master Car-Builders' standard.

Mr. FORNEY thought it very desirable that the two associations should adopt the same standard.

Mr. WELLS said that there was much opposition to the standard car axle as adopted, and it was coming into use very slowly.

Mr. JOHANN thought that Mr. Forney's resolution gave sufficient freedom to the committee, and that it was very desirable that they should confer with the other Association, and should gather as much information as possible. He was an advocate of large axles, and knew that the use of the standard on the cars of his road had reduced expenses.

Mr. SEDGLEY would be very reluctant to adopt the Master Car-Builders' standard until he had evidence that they were generally using it themselves.

Mr. TURREFF said that on his road they were using the standard axle under many cars, and had realized a considerable saving in oil and brasses from the large journals.

SECRETARY SETCHEL said that there was a growing tendency to use larger journals. On his road they had secured much better results from the larger journals. He believed in adopting a standard for all equipment, if possible. The committee should certainly confer with others and gather as much information as they could.

Mr. LAUDER thought the committee could not do better than to confer with the Master Car-Builders.

Mr. JOHANN thought such conference was necessary, and that united action by the two associations was desirable.

Mr. BLACK thought that very few members were ready to adopt a standard axle.

Mr. WELLS thought that they should be able to determine on a standard axle without going to the Master Car-Builders.

After a little further discussion, Mr. Forney's resolution was adopted.

The PRESIDENT appointed as the committee Messrs. Sedgley, Cooper and Boon.

Mr. SEDGLEY thought it desirable to have as good a representation as possible and moved that Mr. Hudson be added to the committee.

After a little discussion the committee was increased in number to five, and Messrs. Hudson and Forney added to it.

The discussion on the report on wheels and axles was then closed.

LUBRICANTS.

The Committee on Lubricants being called on, the SECRETARY stated that no report had been prepared, owing to sickness in the family of Mr. Fry, the Chairman. A letter on the subject had been received from Professor Thurston, of the Stevens Institute, which was read.

The letter was accepted and referred to the Supervisory Committee, with power to print such portions of it in the proceedings as they might deem proper.

The report of the Committee on Correspondence was read and received.

On motion of SECRETARY SETCHEL it was resolved to instruct the Secretary to reply to a number of invitations received that it would be impossible for the Association to accept them as a body, but as individuals the members would be glad to accept them and return thanks for the courtesy extended.

The Committee on Boilers was then called upon. Before the report could be read, however, the special order (discussion of questions submitted by members) came up.

CARE OF BOILERS.

The following question was submitted by Mr. JOHANN: "What is the best and most economical method of caring for locomotive boilers when in service?"

Mr. JOHANN said he would also like to hear what was the best and quickest way of firing up boilers. He had used anthracite coal, with very good results in some cases.

SECRETARY SETCHEL said that some made a practice of blowing out an engine as soon as it came in, while others would run it into the house and allow it to stand some time with the fire in, both parties claiming good results. Those who blew out at once had less trouble with sediment and scale. Others again would never let an engine get cool except to be washed out. The Pennsylvania Railroad was making some trials on this point. If the boiler was filled up with cold water after blowing out, it was very apt to crack the fire-box sheets by too sudden and uneven contraction. The same thing took place when washing out the boiler, and it was worth considering whether it would not be well to wash out with warm water.

Mr. SEDGLEY had not been troubled by side sheets crack-

ing in this way since he took out the brick arches formerly used in his engines.

Mr. RUSHTON said that he always had his boilers blown out when they came in. He had much less trouble from sediment in this way, the boiler being washed out. When the engine was left to cool down the mud had time to settle and get hard. He thought most explosions were caused by improper bracing.

SECRETARY SETCHELL had obtained very good results by requiring the feed-water to be warmed. It was not only economical, but it caused most of the sediment and scale to be deposited in the tank, saving the boiler.

Mr. HUDSON believed in filling boilers with warm water and also in using warm water in washing out. He had found much less trouble from tubes leaking.

Mr. WOODCOCK always used cold water to wash out, after letting the engine stand over night to cool down.

The discussion was then closed.

LOCOMOTIVE BOILERS.

The report of the Committee on Locomotive Boilers (which we have published June 14, page 291) was then read. It was received and the documents submitted with it referred to the Supervisory Committee, with instructions to print in the annual report such portions as might be of sufficient value to preserve. The report was then taken up for discussion.

PITTING OF BOILER SHEETS.

Mr. HAYES said that he had carefully considered the matter of pitting or corroding of sheets, and was convinced that it was the result of chemical action, the salts in bad water taking hold of the iron.

Mr. FORNEY supported this view. In some comparatively pure water there were vegetable substances which would cause chemical action on the iron. The same action would take place in steel boilers. It was very important to know the quality of the water used and what it contained.

SECRETARY SETCHEL said that when steel was first used it was thought to be less liable to corrosion than iron, but now there was some difference of opinion.

Mr. HUDSON also believed in chemical action. In some engines built for Peru he had put steel flues, and found that they corroded faster than the iron ones.

Mr. BOON had had some steel boilers in use five years with no trouble from pitting. He thought that there was mechanical as well as chemical action, the former paving the way for the latter.

Mr. WOODCOCK attributed corrosion to chemical action, but has found steel boilers free from it.

Mr. SEDGLEY thought that very much depended on the quality of the steel.

Mr. WELLS had found steel sheets corroded, and thought there was little difference.

Mr. JOHANN thought that many experiments were needed to determine.

A recess for dinner was then taken. After recess the discussion was continued, the section of the report on the form of the boiler being taken up.

FORM OF BOILER.

Mr. SEDGLEY said that he had, since 1860, built boilers of a tapering form, the taper being about 4 in. in 11 ft., and thought this form quite as good as a wagon-top boiler. In his mogul engines he put the dome forward of the fire-box, and had found no trouble with the crown-sheets. He had found that the quality of fuel used made a much greater difference than the form of the boiler.

Mr. HUDSON said that the tapering boiler had one advantage in giving a larger water surface from which the steam could escape. It was of importance to have abundant steam room, in order to avoid carrying over wet steam into the cylinders. He had always advocated straight boilers, with as few longitudinal seams as possible.

DOMES.

Mr. RUSHTON had found good results from tapering boilers. He thought the dome was better on the cylinder of the boiler than on the wagon-top, if it was properly braced.

Mr. HUDSON thought the dome could be made sufficiently strong, especially if the boiler-sheet was flanged as well as the dome-sheet, and a ring of rivets put in around the base of the dome.

Mr. RUSHTON had had engines running for several years without giving trouble when the domes were properly braced.

Mr. WELLS thought that the extra ring of rivets made the boiler-sheet under the dome fully as strong as in the longitudinal seams.

Mr. SEDGLEY had one boiler that had been in service 26 years in which the sheet was not flanged upon the dome. He thought the wagon-top form of boiler gave the best results. He had engines with every form of dome arrangements, but his troubles had not come from the dome, but from the fire-box.

Mr. HUDSON thought it very good practice to put braces from the crown-bars to the outside shell of the boiler.

Mr. SEDGLEY thought a boiler was not safe without such braces.

Mr. FORNEY asked Mr. Hudson if flanging the boiler-sheet up inside of the dome and adding a ring gave the sheet its original strength, or if it did not rather weaken it.

Mr. HUDSON said that it would not give the original strength, but he had found that the engines he had built in that way made a very good record.

Mr. FORNEY thought that many explosions could be traced to weakness in the dome and braces, and the danger increased as larger domes were favored. European practice was better in this respect.

Mr. HAYES said that he made the hole in the boiler-sheet just large enough for a man to get in and examine the crown-sheet. He thought it very important to have the crown-bars and the wagon-top well stayed together.

Mr. HUDSON thought that American practice was best, for we did not depend entirely upon the side-sheets to support the crown-bars as they did in Europe.

Mr. FORNEY said that there was no uniformity in European practice in this respect. He had seen many boilers give way on account of the rivets around the dome, and this ought to be prevented.

Mr. HUDSON had never seen an explosion caused directly in this way.

Mr. SEDGLEY had seen consolidation engines with no braces from the domes to the crown-bars, which had been under 200 lbs. pressure without apparent injury.

Mr. RUSHTON used the braces from the crown-bars to the outer shell and also to the dome. The real object of these braces was to sustain the irregular shape of the outside shell. He had seen boilers cracked through the wagon-top, but they were not well braced.

FIRE-BOX SHEETS.

The section of the report relating to the form and material of fire-box sheets was then taken up.

Mr. SEDGLEY said that there was a great difference of opinion as to the amount of heating surface required for a given size of cylinder. The quality of the water made a very great difference. On some parts of his road the water was pure, on others bad, and he found it made as much as 25 per cent. difference in the heating surface. With pure water the present form was good, but with bad water more water space and heating surface was needed.

Mr. WELLS said the question was whether it was better to carry more water over and around the fire-box, or to put in more tube-surface. In this respect he thought a straight boiler best, as giving a larger water-space and exposing a larger surface of water.

Mr. JOHANN had given much thought to boilers and had tested and examined many. Insufficient water-spaces were a great and constant source of trouble. He had examined boilers where the water-spaces around the fire-box were closed up with mud and scale, so that water could not circulate, and it was a wonder how the boiler made steam at all. There must be more room for circulation. He was now building some boilers with more water-space, and proposed giving them a fair trial. He thought, also, that good results might be had by separating the flues more at the front end.

Mr. SEDGLEY had been making some tests as to the escape of heat at the front of the boiler, and intended to continue them until he had more accurate facts. In this respect he had found his taper boilers work very well. He was convinced that more water-space was needed.

Mr. WELLS said that Mr. Higginbottom, of the Schenectady Locomotive Works, had been making some tests and had found that there was a great difference in the escape of heat with different qualities of coal.

Mr. RUSHTON thought that wider water-spaces would prevent much of the cracking of fire-box sheets. He also advocated wider spaces between the flues.

The discussion was then closed.

A motion to appoint a committee to prepare a memorial on the death of Mr. J. A. Hanglin, of the Texas & Pacific, was carried, and Messrs. Johann, King and Devine appointed as such committee.

A letter from Mr. Gordon H. Nott on the death of the late Edwin H. Garfield was then read, and ordered placed upon the minutes.

Committees on Resolutions and on Place for Next Annual Meeting were then appointed, and the Convention adjourned until the next morning at 9 o'clock.

The Proper Gauge for Cheap Railroads.

BY BARON M. M. VON WEBER.*

[*Translated for the Railroad Gazette.*]

I.

TWO CARDINAL QUESTIONS.

By reason of the railroad programme of the Imperial Government, which includes designs from several secondary railroads, among them some with a gauge narrower than the standard, two questions of importance to the whole technical and economical development of railroad business have again come to the front for discussion.

The first of these questions is:

Are there advantages to be gained in the economy of the construction and operation of railroads by the reduction of their gauge, and of what kind and especially how great are they?

The second is a consequence of the first:

Which gauge, standard or narrow, is best suited for the construction of railroads of secondary importance, or of especially local interest?

Both questions have already been treated exhaustively in the technical and scientific world and literature. On account of their nature, however, these discussions could not be within the comprehension of the general public, which indeed includes the circles and factors of the state which decide the railroad policy.

Therefore the general opinions in this matter remain conflicting and indefinite. But it is now time to view these questions, free from the formulas and jargon of science, and, having propounded them clearly and objectively, to explain them briefly and in a popular manner to the sound human reason, in order that mistakes make be avoided which it would be hard to repair.

The author, who has prepared most practical discussions of the subject, and circulated them in the technical world,† may properly consider himself qualified for such an exposition. He choses for it the form most generally intelligible, when necessary for clearness—the catechetical form. He requires no "faith" for his statements, for he expresses no subjective opinions, but he requests an objective observation and examination for the facts which he reports.

The question whether standard or narrow gauge, is no more to be answered on general principles than the question whether a "way" should be narrow or wide. A "foot-way" would "properly" be narrow; a "highway" wide.

The objects of the railroads, the differences in the traffic required of them, the difficulties encountered in their construction, are just as various as those of the different kinds of common roads which are included between the foot-path and the highway.

The standard gauge is just as appropriate as the narrow gauge, each in its place. A road which carries nothing but coal, stone, timber, ore, or at most has a few slow passenger trains, must everywhere be considered differently from another over which a dozen express trains rush back and forth daily—if both are to be constructed economically, in accordance with their nature.

The question: What specific advantages will result from the adoption of the standard or narrow gauge in the construction of a railroad, disowns this gospel of all economy. This question places the matter in a wrong light, because in discussing it things which have nothing in common are forced to a comparison. Some one takes statistics, deduces averages of the cost of construction and working expenses of great trunk lines, and compares these with the expenditures for construction and operation of a secondary railroad meandering through difficult ground, with a slow traffic, and concludes straightway that those trunk lines could have been properly built just as cheaply as these latter if only the same method of construction had been adopted. A full-blooded horse and a donkey belong to the same genus of animals, and each in its way is a very valuable creature, but their services can no more be compared than their cost.

In fact, only those roads should be compared as to economy of construction and operation on which the requirements of traffic, in regard to amount, frequency, speed and nature, are, at least in the main, the same.

How far the gauge of the lines under consideration exercises an influence is the first question, to which the following brief discussion is devoted. In this, only those secondary roads can be meant which have to carry both passengers and freight. The discussion of the question does not extend to all grades of local roads, from the track on which the mine cars run into the adit to the line which connects an elegant bathing resort to a main line.

The so-called "standard gauge" of railroads (4 ft. 8½ in.) is not the result of technical investigations, but occurred entirely by chance, because the first roads with tracks in the North of England were made to fit the usual gauge of the wagons used there for carrying coal on the highways.

Nothing is more natural, then, than that in the early days of railroads, when no one could have any idea of such a connection of lines and net-works as the railroad map shows to-day, there should be deviations from this accidental measure, and always in favor of larger dimensions. In England, Ireland, America, etc., great systems of lines were established with wider gauge; Russia, Spain, Holland, Baden, etc., etc., adopted such gauges as their standards.

In this way many advantages in construction were attained. But when the connection of the system was completed, and the passage of freight through on the same car became a requisite to economy in freight traffic and comfort in passenger traffic, the break of gauge became impossible, and all European lines and states (with the exception of isolated Spain, and of Russia, which on account of its great extent assumes to act independently) hastened, with enormous expense and difficulty, to change their roads to the standard gauge.

A great statesman thus designated briefly three unities as fundamentals of the world's traffic: money, weights and measures, and railroad gauge.

The economical disadvantages which had been demonstrated by the construction of lines wider than the standard gauge (especially when the width was too great, as, for example, the 7 ft. of the Great Western Railway in England, the 6 ft. in Holland, etc.) led to the extreme.

An inverse conclusion was made, that, just as much as the wider gauge roads had been too dear, those with a narrower gauge must be cheaper than the standard.

The construction of lines was begun whose traffic must be intended to be isolated for all time from the traffic of the world, or whose freights were of such a nature that the cost of transferring them would seem to be more than balanced by the saving in construction over the cost of a standard-gauge road; or systems were begun whose extent and the traffic common to them seemed to guarantee them an almost independent existence; and finally lines were planned where, either by the utilization of the highways for the construction of the roads, or by other local circumstances, peculiar advantages were connected with the use of the narrow gauge.‡

Thus were produced the Swedish and Norwegian narrow-gauge roads, the Festiniog Railway in England, the Antwerp & Ghent Railroad in Belgium, the Bröhlthal road in Rhenish Prussia, the narrow-gauge system in Upper Silesia, the Lambach & Gmunden road in Austria, a few new lines in France, and short railroads in Switzerland, aside from a number of lines for the use of great industrial establishments, whose circumstances are entirely different from those of public railroad interests, and exclude comparison with public roads, although their extent, as at Reschitza, Essen, Dortmund, Creusot, etc., includes many kilometers.

On several of the above lines which, on account of their isolation, the variation from the standard gauge had been found economical, it disappeared through connections and before unexpected interchanges of traffic.

The reconstruction of the Swedish narrow-gauge roads, which connect the great seas, apparently situated where they were unapproachable, became necessary when transfer ferry boats were established to carry over cars; that of the Lambach & Gmunden road arose from the effect of the extension of the line; and the operation of the narrow-gauge roads in Upper Silesia was long ago changed from locomotives to horses, the former being found uneconomical.

In the civilized countries of Europe, the narrow-gauge system, in its application for public use, on the basis of the experiments made with and on the above-named lines, has found no further diffusion; on the contrary, it is being continually restricted.

It is different in the wide territories of other continents, where there are immense distances between the connections, the population is comparatively thin, and

* Formerly for many years manager of the Government Railroads of Saxony, afterward Consulting Expert in Railroad Matters for the Austrian Government, and recently appointed Imperial Councillor and called to Berlin to an office in the Ministry of Commerce and Public Works, where he has the supervision of the establishment of a great system of secondary railroads to be constructed in Prussia. His experience in railroad service extends over some 30 years. In the preparation of his larger work on "Experience with Secondary Railroads in Europe," he visited, examined and reported quite minutely upon nearly every narrow-gauge and other light railroad in Europe, some of which are among the oldest on the continent, and all his statements are backed by the actual facts in the experience of these roads, which he has recorded in this larger work. Weber is universally recognized in Europe as one of the ablest of railroad men, and he is probably the very first of German writers on railroad affairs, general as well as technical.—THE TRANSLATOR.

† M. M. von Weber: Die Praxis der Baues und Betriebes der Secundärbahnen mit schmaler und normaler Spur, etc. Weimar, Voigt, 1873. (Experience in the Construction and Operation of Secondary Railroads with Narrow and Standard Gauge.)

Die Individualisirung und Fortentwickelbarkeit der Eisenbahn, 1875. Leipzig, Teubner. (The Individualisation and Development of the Railroad.)

Neue Pfade der Volkswirthschaft. (New Paths of National Economy.) Die Secundärbahnen, etc. (The Secondary Railroads, etc.) Weimar, Voigt, 1874.

Nationalität und Eisenbahn-Politik. (Nationality and Railroad Policy.) Vienna, Hartleben, 1875.

‡ In France, in the latter years of Napoleon's reign, an administrative and financial principle, the protection of "the monopoly of the great railroads," also became the motive for the adoption of the narrow gauge for certain railroads. We will mention this further hereafter.

makes slight demands for accommodation and prompt transportation, and all the ideas of a dawning civilization make quite different demands on the engineering economy of the railroads than in the highly cultivated countries of Europe. There in the Western, Southern, and Central states of America, in the East Indies and Australia, in parts of Russia, etc., narrow-gauge railroad systems have been developed of so great extent and of so distinct traffic relations that each, for the present, may be considered as independent, and its method of construction be chosen without regard to that of other roads. There the narrow-gauge system has found development with half a dozen different gauges. Whether this policy will be shown to be a mistake to the railroad proprietors who have considered only the present circumstances, remains to be seen. At any rate, the circumstances of those countries are too much unlike ours to make it advisable to be guided by their results.

II.

CHARACTERS OF THE SYSTEMS.

In order to secure a just standard for the examination of the general advantages and disadvantages which would result from the application of the narrow-gauge (say one meter, or 3 ft. $3\frac{3}{8}$ in.) in this country, we must ask ourselves a few questions in regard to the peculiarities of the system on which those advantages and disadvantages depend.

1. *Does the narrow-gauge system permit the use of sharper curves than the standard-gauge system?*

Undoubtedly, and herein lies the chief part of its economical value for railroad construction.§

With circumstances otherwise the same, that is, with the same speeds and wheel-base (distance of the axles from each other) of rolling stock, curves can be used on the narrow (meter) gauge road whose diameters are in proportion to those permissible on the standard-gauge, as 1 to $1\frac{1}{2}$ (nearly).

This makes it possible for the road to go around the difficulties of the ground more easily, to fit it more closely to the elevations and depressions of the surface, and thus diminish the number and extent of the earthworks and structures, and thus it may, especially in mountainous districts, assist materially in keeping down the cost of construction.

Only we must take care, in our effort to build cheaply, not to increase the cost of operation to such a degree as to make the economy in construction wholly illusory, and even render it an irremediable disadvantage.

The ability to curve the road is limited by the relation which must exist between the wheel-base of the rolling stock and the radius of the curve, if the latter is left so that it can be run through; by the decrease of performance of the motive power on curves, due to the increase of resistance; and in the addition to the cost of maintaining the track, the guarding of the road, etc. Only in wholly exceptional cases will it be necessary to proceed to the extreme limit of what is permissible on the narrow gauge in reducing the radius of curves, and in very many of these cases the result will be that the increase of the working expenses will represent the interest on a larger capital than it would have been necessary to expend to avoid the sharp curve.

Nevertheless, the chief economical advantage of the narrow-gauge system of railroad construction consists in the permissibility of sharper curves.

2. *Does the narrow-gauge system permit the use of a steeper grade than the standard-gauge system?*

The ability to ascend grades on railroads depends on the adhesion (caused by the weight of the locomotive) of the wheels on the rails, and on the capacity of the engine for generating steam (aside from uncommon methods of locomotion).

The gauge is evidently wholly without influence on the amount of the adhesion of the wheels on the rails; but the reduction of the gauge increases the difficulty of constructing engines of as great capacity as those of standard gauge on so narrow a base, as the economy of making steam decreases rapidly with the dimensions of the steam-generator (the boiler). Hitherto the latter has been only partly attained, and that by sacrificing one of the main virtues of every mechanism, that is, simplicity (by the so-called "double-truck" engines of Fairlie, Meyer and others), and by the production of locomotive mechanisms whose complication and the difficulty of whose management make them little suited for narrow-gauge railroads especially.

But if the handling of a certain amount of traffic, by reason of the smaller capacity of the engines, must be effected by its distribution among a greater number of smaller trains, then the expenses and risks of the operation increase in the same degree as the capacity of the rolling stock decreases. The same bulk of traffic, therefore, especially if it must be moved within a certain time, can never be moved with the same economy in motive power on a narrow as on a standard gauge road.

We will return to this subject further on.

3. *Is the saving in earthwork and masonry considerable that can be secured by reducing the gauge?*

By the indirect effect of the reduction it may be considerable, so far as it, as above mentioned, renders it possible here and there wholly to avoid or to reduce the dimensions of earth-works and structures, by permitting a line which closely follows the natural surface. The savings obtained, compared with the construction of a secondary road of standard gauge under similar circumstances, where the requirements are very unfavorable for the latter, may amount to as much as 30 per cent. of the cost of the substructure.

But as the expenditure for earthworks and structures for a standard-gauge secondary railroad, according to experience, on the average amounts to only 15 to 20 per cent. of the total cost of construction, this economical effect in fact is not so great by far as many think or pretend, and it will seldom amount to a difference of 10 per cent. in cost of construction between a standard and a narrow-gauge line *constructed to meet equal requirements.*

According to the observation of the distinguished Swedish engineer corps, which of all technical bodies in Europe has had the widest experience in the construction of secondary railroads, with the most various circumstances of surface, by reason of the considerable number of them in Sweden, made of three different narrow gauges and of the standard gauge—according to their observation the economical advantage of the narrow gauges in the direction mentioned is still less, and disappears entirely in a country which admits curves of about 1,300 ft. radius for the standard gauge.‖

4. *Does not the reduction of the gauge permit a corresponding reduction of the width of all structures?*

At first it seems extraordinarily plausible, and even self-evident, that with a narrower gauge and nothing more a corresponding reduction of the width of all earthworks and structures must go hand in hand. This, however, is one of those fallacies to which railroad engineering only too often leads the views of laymen.

Secondary railroads of standard gauge are seldom made with a breadth of more than 10 ft. 8 in. over the surface of road-bed.

Experience has shown, however, that earthworks, in order to be always stable, able to endure the weather and economical in maintenance, must have a certain width; that, further, the distance between the rails and the angle of slope must be the same with the narrow as with the standard gauge, in order to be capable of enduring the side pressure of the track when a train passes, and not to endanger the track in case of slight washes and slides; that finally, neither ties nor ballast, if they are to give sufficient lateral stability to the track, can be shortened or lessened at will with the reduction of the gauge.¶

From these and some other causes, the discussion of which latter would lead us too far here, it has resulted that *hitherto no narrow-gauge railroad in Europe for public passenger and freight traffic has been constructed with a surface of road-bed less than 9 ft. 10 in. wide.***

So that the difference in the width of structures of roads whose gauges differ by about 30 per cent., amounts to only about 15 to 18 per cent.

Similarly, a reduction of the dimensions of the space, height and breadth of passenger-car bodies in proportion to the reduction of the gauge is prevented by the space required by the dimensions of the human body. ††

Every man who has worked a railroad knows further that with a reduction of the dimensions of the bodies of the freight cars, the facility of disposing of the freight in them—the economical utilization of them—is reduced, so that certain staples of traffic of customary dimensions (such as bales of wool, certain boxed goods, casks, etc.), and especially live stock, absolutely require certain dimensions in the car-body, which forbid their reduction in proportion to the gauge. Thus again the result has been that the dimensions of the rolling stock on all narrow-gauge roads that have been built have been considerably greater than would have been proportional to the reduction of the gauge. From this again it follows as a consequence that where the narrow gauge is adopted, only a moderate percentage of the saving in tunnels, cuttings, viaducts, structures, etc., can be attained, that might have been expected from the reduction of the gauge.

5. *Is there any saving to be effected in the superstructure of narrow-gauge roads in comparison with the standard gauge?*

We have just laid down the chief elements which have caused that greater dimensions in the breadth, height and space must be given to the rolling stock of narrow-gauge railroads than would naturally occur by the lessening of the gauge.

This means, to speak so as to be generally understood, a relatively much larger and higher car-body on a much narrower base on the narrow gauge than on the standard gauge.

The natural consequence of this is that every inequality, depression, deviation, on the narrower foundation must cause a much greater oscillation of the higher, larger, heavier car-body than in the broader base of the standard gauge, while on the other hand the oscillations of these vehicles must have a much more destructive effect on the narrow superstructure than those of the cars of standard-gauge roads. This reciprocal effect increases the demands on the superstructure as well as on the cars. It follows from this, again, that, in order to secure equal safety and comfort, and equal economy in motive power in operation, the running trains being the same, the superstructure of the narrow-gauge roads must be made relatively stronger and must be much better maintained than that of standard-gauge roads, and especially because on the sharper curves of the narrow-gauge roads with equal speed, the danger of derailment is greater (because of the centrifugal force and the greater effect of the play of the wheels on the track) than on the easier curves of the standard roads.

Therefore on the narrow-gauge roads that have been constructed, longer ties, heavier rails, deeper ballast, etc., have been used than was to have been expected, *a priori*, as proportioned to the gauge and requirements of traffic. This truth is shown most clearly by the road of narrowest gauge ($23\frac{1}{2}$ in.) that exists, the Festiniog Railway in Wales, on which the weight of rails has been increased from 15 to 50 lbs. per yard, whose ballast had to be raised to the thickness of 2 ft., whose ties are double the width of the gauge in length, and are as broad and thick as those of main roads, and whose rail joints have to be provided with the strongest kind of fish-plates, in order that the track may be kept in condition to be run over.

Nowhere has the maintenance of the narrow-gauge track proved in practice to be cheaper than that of the standard gauge, very often dearer; on the average always dearer, when the quantity moved is taken into consideration.‡‡

It is evident that with the narrow gauge the station yards (since here the dimensions of rolling stock and the radii of curves govern) diminish somewhat, though not entirely in proportion to the reduction of the gauge, and with them the sometimes considerable cost of such grounds; that the turn-tables and transfer-tables are smaller and cheaper, while in the price of the switches there is no difference worth mention. The other expenditures for establishing stations remain, if the demands on them are similar, the same for both systems, save a slight reduction of the dimensions of structures for the operation of the narrow gauge. For the narrow gauge there are added the cost of the often costly over-head tracks for dumping cars, inclined planes, cranes, and other apparatus serving for the transfer of freight.

As to cost of right of way, which, however, except under extraordinary circumstances, forms but a relatively small part of the cost of construction, especially in mountain country, the special field for secondary roads, the narrow gauge may sometimes exercise a favorable influence, since it facilitates the avoidance by means of curves of what would be costly to buy; but here again there is always danger that the operation will be injured more than the construction will be benefited.

Although in what precedes we have adduced only the chief points of view which the experience of the secondary railroads completed in Europe present for the comparison of the relative economical peculiarities of the standard-gauge and the narrow-gauge systems, yet from these will be recognized the sufficient grounds of the final conclusion of that comparison, based only upon facts.

The construction of a secondary railroad line will require on the whole nearly the same expenditures, assuming that the requirements on it by the bulk, form, speed, frequency and nature of the traffic are the same, whether it is made with the narrow or the standard gauge (although the cost of the substructure, superstructure, stations, etc., differ), and for this reason, that the greater cost of superstructure and the less cost of substructure on the narrow-gauge nearly equalize its cost with that of the standard-gauge.

6. *Is the rolling stock cheaper for a narrow or for a standard-gauge road?*

The answer to this, again, can only be made under the assumption that equal requirements as to speed and bulk of traffic are made on the roads to be compared. The capacity of the single vehicle of a narrow-gauge road is less than that of the corresponding vehicle on the standard gauge. Its parts are weaker and smaller, but the number of them is the same, and therefore the labor in making one is nearly the same, though the quantity of material is less. Two cars, each of 11,000 lbs. capacity, therefore, cost not only as much as one of 22,000 lbs., but far more.

Since, now, for the same service on a narrow-gauge road a greater number of cars is necessary than on the standard-gauge road, so also is the cost of the car equipment sufficient for the same traffic on the standard and narrow-gauge road considerably higher on the latter than on the former.

The case is the same with the repairs and renewals of the cars, the expenditure for which is determined less by the size and weight of the parts than by their number, as is known to every mechanic of moderate experience. Further, two cars of 11,000 lbs. capacity weigh not only as much as one of 22,000 lbs. capacity, but very much more: indeed, one of the latter is not much heavier than one of the former. On this depends the progress of all economy in transportation, that the traffic be forwarded in the smallest possible number of cars of the greatest possible capacity, and thus the dead weight of the cars be decreased in proportion to the weight of the freight.

Now, on the narrow-gauge road the same traffic is divided among many more cars of smaller capacity, whose total weight is far greater than that of the cars for the same service on the standard-gauge road; thus the economy of transportation is considerably more disadvantageous on the narrow than on the standard-gauge road.

Likewise, it is difficult to secure a satisfactory utilization of the passenger cars of the narrow-gauge roads, which afford little accommodation. Nearly the same phenomenon appears with regard to the effectiveness of the locomotive.

As has been said above, hitherto the builders have not been successful in constructing locomotives for narrow-gauge roads whose economy in performance, for the same requirements, is equal to those of standard-gauge roads, since this economy, as remarked above, depends chiefly on the size of the steam-generators, which cannot be carried so far on the narrow as on the standard-gauge road.

The transportation of the same load with one powerful, instead of two weak engines, costs much less for fuel, wear, maintenance, repairs, etc., aside from the fact that two smaller engines which do the same work as one large one, costs much more than the latter.

Thus in regard to economy of motive power also the narrow-gauge road cannot equal the standard-gauge.

§ It must be remembered that Baron von Weber writes of railroads of the European system, with four-wheeled cars, for which a moderate curvature, or what would be so considered here, is indispensable. Actually, with American rolling stock curves are practicable with the standard gauge, and are not uncommonly used, which have less than half the minimum radius of the shortest curve on European narrow-gauge roads. The largest traffic in America, and probably the second largest in the world (about 300 trains each way daily), is done to-day without the slightest difficulty on a road of standard-gauge which has curves of 90 ft. radius.—NOTE BY TRANSLATOR.

‖ It must be remembered that this is for European rolling stock, and that with American rolling stock curves of 300 ft. on standard-gauge roads are worked without difficulty, and even curves as low as 75 ft. radius are worked safely, though of course with great reduction of the effectiveness of motive power.—TRANSLATOR.

¶ See Weber: "Praxis der Secundärbahnen, etc.," 29.

** Even the Festiniog Railway, whose gauge is only $23\frac{1}{2}$ in., is made with this width of road-bed.

†† See Weber: "Praxis der Secundärbahnen," p. 64, etc.

‡‡ Weber: "Praxis," p. 38.

Experience in the operation of those European narrow-gauge roads which carry passengers and freight has afforded these conclusions to our hands, and by the high figures of their total working expenses has established this fact: *that hitherto efforts have not succeeded in rendering the operation of the narrow-gauge roads cheaper than that of the standard-gauge roads; that indeed in most cases the former fall behind the latter in economy.*

The question of the economy in equipping the two systems takes a wholly different phase, however, when we take into consideration the fact that on the standard-gauge secondary road, whose traffic naturally can be carried at much lower speed than that of the main road, the whole equipment of locomotives, passenger and freight cars, turn-tables, switches, transfer-tables, etc., which have become inadequate to the amount and speed of the service on the main line, and in construction have fallen behind the times, can find employment for many years, being perfectly well calculated in regard to economy, construction and safety, for the slow service of the secondary road.

The great roads find daily fewer and fewer chances for employing and utilizing this material, whose cost has often been already charged off from the books of the companies; and for lack of employment it is offered for sale at trifling prices, to be broken up for the old materials.

Equipment with such material, which but recently was sufficient for the traffic of Europe, will always answer the purposes of the secondary railroads, and have the immense advantage that the proper material for increasing it is always at hand, that the shops of the main lines possess the tools required for maintaining it and the models of its parts, that finally the officers and employés going from the main to the secondary roads are familiar with its every detail, and know how to manage it.

While thus the provision of the equipment may be effected with a true minimum of expense, the main line which undertakes the secondary road has the ability to conduct its operation at a decidedly cheaper rate, since the secondary road affords it an opportunity to utilize its equipment to the utmost. The advantage will be attained, in regard to economy not enough valued, of a rational, actual "using up" of costly material, whose value now is lost by its removal from the operation of the main roads to be broken up; while still a considerable amount of service can be obtained from it by its use on roads of subordinate rank.

The equipment with the material of the connecting roads, moreover, secures to the standard-gauge secondary roads the advantage that they need be provided only with equipment enough for their average amount of traffic, since in case there is an extraordinary pressure of traffic, the main line can assist it with its entire rolling stock, which in every respect is suited to the narrow-gauge road. If now for the through traffic over the main line a suitable share of the latter's rolling stock is added to that of the secondary road (and it is perfectly available in the latter's slower trains), then the equipment of the secondary road is effected in a way which satisfies economy in the construction account as well as in operating, together with the requirements of the relation with the main road, and all so as to suit the objects of both equally well.

The picture which shows the cost of providing and the economy of working the rolling stock on a narrow-gauge road is a wholly different one.

The latter must be designed in accordance with the dimensions and peculiarities of the road, and constructed new throughout. The cost of providing the rolling stock of a narrow-gauge road would, as we have shown above, assuming equal requirements, come to more than that of a standard-gauge road, even if the latter also had to be bought new.

Under these assumptions, which are almost always realized, the difference against the narrow-gauge becomes a truly enormous one, calculated to cast into the shade any advantage which the economy of construction of a narrow-gauge road can possibly offer.

To this must be added that all the apparatus connected with the operation, such as turn-tables, water cranes, transfer-tables, switches, etc., must all be provided for the narrow-gauge after new models; that the workshops must have different arrangements from those of standard-gauge roads, and the tools for manipulating and repairing the parts must be different; that the employés must make themselves familiar with an entirely new set of railroad appliances, whose peculiarities are grasped only after long experience; that, finally, there can be no, or scarcely any, thought of coöperation between the narrow-gauge road and the connecting standard-gauge road by the loaning of spare parts, models, etc.

It is of much greater weight, however, that the narrow-gauge road can receive no assistance from the rolling stock of the connecting road, and, therefore, if it is to fulfill its objects, must be itself provided with an equipment sufficient for its maximum traffic, only offered occasionally, and which therefore must be much beyond the proper average need of the road, and so burden it with loss of interest on capital.

In discussions of the gauge to be given this or that road, which was to be constructed over difficult ground, this necessity of providing a wholly new equipment after models of a new system, different tools, shop apparatus, operating appliances, etc., in many cases has been decisive against the narrow-gauge, as evidently the construction and the working of the road would have been made costlier thereby, aside from the isolation of the line from any assistance from the connecting main roads.

In fact, the greater expenditure required for the new equipment of a narrow-gauge road with a stock sufficient for its maximum requirements, in comparison with the cost of an equal provision for a standard-gauge road which uses the worn material of the main lines, in almost all cases considerably exceeds the saving in construction due to the adoption of the narrow-gauge; and it certainly always does so in those cases where the country on the line is not extremely difficult and the development of the economical peculiarities of the narrow-gauge system is not exceptionally favorable.

III.

ECONOMY IN WORKING.

Having in the foregoing described the advantages which, each in its way, the standard-gauge and the narrow-gauge systems offer in regard to economy of construction and equipment, there still remains for us only to answer a few questions on the circumstances which exercise an influence on the economy of working secondary lines of both systems, and which have not yet been touched upon in the foregoing.

Here also we have adhered firmly to the results of experience.

7. *How is it with the utilization of the rolling stock on secondary railroads of the two systems?*

If standard-gauge secondary roads were worked with the speed of the main lines, then naturally the utilization of their freight cars would be on the average nearly the same as on main lines, that is, not far from 40 per cent. of their capacity.

The proportion, however, is greater, on account of the lower speed of secondary roads; since this lower speed permits the cars, at least for the local traffic of the road, to be more heavily loaded than would otherwise be admissible. Moreover, the nature of the traffic which prevails on secondary roads, consisting chiefly of raw materials, for which the time of delivery is usually little restricted, makes it practicable to wait for full loads, etc.

Those cars which run through on the main lines naturally can only receive the load which is permissible on the latter.

The ordinary dimensions of the car bodies and platforms, however, make this profitable heavier load for the slow local traffic practicable only with certain traffic staples, such as ore, some kinds of coal, metals, salt, certain kinds of grains, timber, stone, etc.

By the inability of its cars to run over roads worked with fast trains the narrow-gauge system secures the advantage, that all its cars may be constructed for the greater load at the lower speed.

On roads destined solely for carrying produce (to the exclusion of passengers), for this reason a proportion between weight of car and of car-load may be attained more favorable than can ever be reached on main roads, which would reduce the transportation expenses to a minimum.

This is impracticable upon narrow-gauge roads on which, together with the freight traffic, and even mixed with it and with equal privileges, a passenger traffic is conducted. The speed of all the trains suited to such a traffic then must not be fixed below 12 miles an hour, if it is not the direct intention to constitute a secondary road for slow trains (7 miles an hour), on which evidently the passenger traffic can have only a wholly subordinate importance. Roads of this system, moreover, are not meant by the Government programme for secondary roads. In this case a still further increase of the capacity of the cars will be possible; but this will, at best, only partly balance the uneconomical influence of the above-mentioned division of the traffic among a greater number of cars, caused by the narrow-gauge.

To an eminent degree the constructor of the rolling stock of a narrow-gauge road will be supported in his efforts for economy, improvement and the establishment of a more favorable proportion between live and dead weight by his ability to give them a simpler construction than on main lines (central buffer system, etc).§§

But all these aids can serve only to modify somewhat the influence of the greater division of the traffic, *and the experience of all narrow-gauge roads operated in Europe, that carry both freight and passengers, has shown that the utilization of the freight cars on them is in no degree more favorable than on the standard-gauge roads.*||

8. *How is it with the transfer of the traffic from secondary roads of the two systems to the main line, and its cost?*

Evidently the traffic of a standard-gauge secondary road is exchanged with that of the main line without delay and without other cost than what is connected with the delivery and receipt of foreign traffic. If the secondary road is worked by the main line, even this disappears.

It is otherwise with the narrow-gauge road, which requires the reloading of the traffic to and from the main line.

This reloading is effected, according to the nature of the freight, in different ways and at different rates of cost.

Ores and those coals which can bear it may be dumped from the cars of the narrow-gauge road, after having been run up on a species of bridge structure over the tracks of the standard-gauge road, into the cars of the latter.

The cost of this method of transfer is very small, and is limited almost wholly to the provision of the dumping apparatus.

The matter becomes more difficult when such materials pass from the main road to the narrow-gauge, when the reloading must be done with the shovel, or at least with the scraper.

In this case the expense of unloading becomes as great as that of a considerable haul.

Stone, boxes, bales, bar-iron, casks, etc., etc., must be transferred by hoisting apparatus or by hand, and their new arrangement in the cars to which they are transferred absorbs time and labor. The reloading by itself is here quite costly, but it would be much less considered if its cost was not increased directly and indirectly by various circumstances. Among these belong the expenditures for the tracks on which the cars have to stand during the transfer; for the buildings where the manipulation can be made under shelter; for cranes, scales, etc.; for office expenses connected with the renewed weighing, sorting and entering of the shipments, since the loads have to be divided in the large main line cars otherwise than in the small narrow-gauge cars; for losses in labor and in the interest on the cost of the cars, which must often remain standing a considerable time at the transfer stations, before they can be loaded or unloaded; for superintendence, switching, cleaning snow, etc., at the transfer stations, etc., etc.

Of these expenditures, which are scarcely mentioned by the extreme advocates of the narrow-gauge system in connection with the bare cost of the labor of reloading, the latter forms only a very small percentage; and the statement that at this or that station such or such a trifle is paid per hundred pounds in the wages of the labor employed for reloading gives a totally false idea of what it actually costs.

But even the whole sum of the expenditures required by the reloading is of less importance than the economical dangers which are connected with the transfer of the articles carried from one gauge to the other.

Most of these articles are in danger of being more or less damaged, or of deteriorating in quality, by the reloading; none of them gain by it. Bales of goods get wet or burst; boxes and pieces of machinery break; corners of furniture, cut stone and terra cotta are knocked off; casks leak; even bricks and drain-tiles lose their customary angles; slates are broken, etc. The possibility of the occurrence of such injuries has, for example, caused the Belgian merchants to avoid shipping all the more valuable freights from Antwerp to Ghent by the direct narrow-gauge railroad between these two cities, and to bear the cost of the circuit by way of Mechlin, solely in order that the goods may not be reloaded.

There are, in fact, only a very few kinds of freight which do not suffer some reduction in value by reloading, and the amount of it would often outweigh the transportation a far greater distance, and sometimes it is too great for comparison.

Ores, materials for roads, timber, and certain kinds of very hard coal, and such as lose nothing in value by being broken (like various English, Belgian and Westphalian coals), suffer no deterioration at all.

On the other hand, every loading or unloading, whether by dumping or shoveling, reduces the value of all Bohemian, Moravian, Austrian and Styrian brown coals and lignites to so great a degree that it is almost inadmissible.

The pecuniary disadvantage, the economical injury, which is due to the reloading of the freight at the transfer from one road to another of different gauge therefrom does not consist solely in expenditure for unproductive labor and time in the reloading itself, in the cost of establishing transfer apparatus, tracks and space, in the delay of the shipment, and the loss of interest on capital and of service during the waiting of the cars at the junction stations; but, by far the greater part, in the dangers to which most kinds of freight are exposed in reloading, and in the reduction of value which they suffer therefrom.

Recently an eminent North German railroad engineer, under whose auspices a little narrow-gauge railroad is to be constructed, recognizing these evils perfectly, has made an attempt to construct rolling stock for it, by which the reloading is to be avoided by transferring (sliding) the entire car-bodies of the roads of different gauges upon trucks arranged for that purpose.¶¶ That this extremely ingenious idea can be applied only within very narrow limits, since it requires for its manipulation arrangements on the standard-gauge freight cars which they do not all possess, is evident. It is impossible to state generally in figures the amount of the disadvantages due to reloading; indeed it is not the same at different junctions for the bare wages of labor and for the same kind of freight.

The same heavy block of stone whose transfer at a great Paris or London station, provided with hydraulic loading apparatus, costs almost nothing, at a little junction station has to be laboriously and slowly moved by rollers and levers from car to car. In this case, perhaps, its transfer costs as much as the whole cost of transportation on the rails.

Wages of labor, instruction of the employés, apparatus for handling, local circumstances, weather, season, etc., etc., will always cause the cost and risk of reloading to vary within wide limits, so that its value in money can never be expressed *a priori*.

The distance the transferred freight is carried has no effect on the cost of transfer. This cost forms a constant amount in the total transportation expenses.

Therefore it burdens short hauls very heavily, and almost disappears on very long ones. The great narrow-gauge systems in America, Asia and Australia, therefore, scarcely feel at all the pecuniary influence of their connection with quite as large systems of a different gauge: while with lines only a few miles long, with light traffic and small earnings, like most of the secondary roads which are now being constructed in Europe, it exercises a very depressing effect, and, should costly payments have to be made for damages a few times, it may actually become overwhelming. This also shows how irrational it is to compare the two systems on general principles, and to adduce results obtained in the construction and operation of roads of one system under certain circumstances as decisive under entirely different circumstances at another place.

9. *Are the reciprocal effects of the passenger traffic between two roads of different gauges as complicated as those of the freight traffic?*

§§ Weber: "Praxis," p. 78.
In Europe cars have two buffers at each end; the central buffer system is used universally on standard-gauge roads in America.—THE TRANSLATOR.

|| Weber: "Praxis," p. 25.

¶¶ Something of the same kind is commonly practiced in this country at junctions of 6 ft. and 5 ft. gauge roads with those of standard gauge. It cannot be applied to transfers to and from 3 ft.-gauge roads to the same extent; car-bodies of that gauge can be transferred to standard-gauge trucks, but standard-gauge car-bodies cannot safely be carried on 3 ft.-gauge trucks.—THE TRANSLATOR.

Not at all. Man is an article of traffic which transfers itself from road to road without cost, though not without trouble. The transfer of passenger traffic from road to road is substantially the same, whether they have the same gauge or not. The transfer of passenger *cars* from road to road, which is often very desirable but is not at all necessary in the interchange of traffic between main and secondary lines, of course is prevented by difference in gauge. Since the rolling stock of the main roads, or equipment suited to them, can be used on standard-gauge secondary roads, on them the passenger finds his accustomed accommodations in full measure. Where it is decided to construct new passenger cars for secondary roads it will be advisable to resort to the American system of construction, with movable trucks, longitudinal passages through the middle of the cars, and entrances at the ends, as these offer great advantages in local traffic for short journeys (especially by day).***

The railroad with the narrowest gauge—the Festiniog Railway in Wales—uses cars of this construction successfully, while the narrow-gauge roads of Belgium, Norway, Sweden and Germany use compartment cars. However, the finest method of construction is the best for secondary roads; the other is fully justified for such roads of standard gauge on account of its utilizing the worn equipment of the main lines.†††

Hitherto builders have not succeeded in constructing passenger cars for narrow-gauge roads in which there was not either an imperfect economy of space, and therefore a comparatively large dead weight per passenger, or an arrangement which affords a less accommodation to the passengers than that given by the standard-gauge cars.

On the only narrow-gauge system in Europe, the Norwegian, whose length is sufficient to permit real journeys on it, and whose cars, therefore, have to provide accommodation for journeys, which is a very different thing from accommodation for trips of a few miles in the day-time, the problem has been solved as well as is generally possible; and there, as on the Antwerp & Ghent road, the width and height of the cars have been made greater than is in proportion to the narrow gauge. Therefore very excellent and costly maintenance of the track is necessary in order to give these cars, with their high centre of gravity and load extending far beyond the rails, a steady motion. In spite of these maximum dimensions the passengers on the Norwegian roads have to content themselves with 19 in. width of seat in the first-class and 16 in. in the second-class cars (there are only two classes), and with a very restricted space for the knees, which to the public accustomed to the railroads of the European continent would be very distasteful. The use of only two classes is generally advisable for secondary roads of this system.

On the whole, the arrangement and accommodation are matters of relatively slight importance on secondary railroads of both gauges, of the kind now under consideration, on which the journey would be in the day-time only, and last only a few hours. Therefore neither system has much advantage over the other in this respect, as the simple requirements of a provincial local traffic can be satisfied by either.

10. *In the choice of gauge, should not some regard be had to the possibility of the secondary roads having to meet military requirements?*

Certainly it is not entirely labor thrown away, in the choice of a gauge for certain roads, to inquire whether, by the establishing of connections in this or that direction, or possible strategic dispositions, a secondary line may become of some military importance (as for a line of supply), even if subordinate and temporary.

To show circumstantially why narrow-gauge roads can have as good as no capacity for military purposes would lead us too far here.‡‡‡

We must refer those who seek for further information on this point to the subjoined summary of the literature on the subject. They are chiefly prevented from the effective performance of military service by the dimensions of their cars, which neither permit the economical stowing of horses nor of wagons and artillery, nor of men loaded with their equipments. In case the investigation should indicate the above-mentioned possibility, therefore, it will be advisable, even at the public expense, to make the roads useful for military purposes, at least in case of need, by constructing them with the standard-gauge; especially as the military capacity of single-track main roads even remains always limited and doubtful.

IV.

FINAL CONCLUSIONS.

11 *a. In what cases and under what specific requirements is the standard-gauge system to be preferred for the construction of secondary roads?*

a. When the saving in construction attained by the adoption of curves permissible only on the narrow-gauge is not great enough to outweigh the advantages which the standard-gauge secures by cheapness of maintenance of way and of equipment with rolling stock, the avoidance of reloading, and the greater economy of operation.

b. When the traffic of the road in question is a mixed one of both passengers and freight, neither of which so decidedly exceeds the other that the road may be made specially a passenger or specially a freight road: an example of the first is the narrow-gauge road from Lausanne to Echellens, in Switzerland; of the second, the Brōhlthal road.

c. When the bulk of the articles carried, which pass from the secondary road to another road, and form a material part of the total traffic of the former, are of such a nature that they either experience a considerable loss in value (as, for example, nearly all Austrian coals) from reloading: or are costly to transfer, and require for such reloading the provision of considerable apparatus; or, finally, are subject to considerable risk from reloading.

d. When the secondary road is of very moderate length, so that the transfer expenses form a considerable percentage of the total expenses of the through transportation.

e. When the transfers from the secondary road to the main road exceed the local traffic of the former, and do not consist of articles whose transfer, rightly managed, occasions almost no expense and no reduction in value.

f. When the bulk of the traffic passes from the main road to the secondary road, and not *vice versâ*.

g. When a considerable part of the traffic consists of articles which can only with difficulty and danger be hauled round the sharp curves of the narrow-gauge roads, or is uneconomical for such roads. Such articles are cattle, for which narrow-gauge cars afford no accommodation, long rolled iron, such as beams, rails, etc., but especially timber, which the effect of traction on very sharp curves forces too powerfully and to a dangerous extent in the direction of the chord of the arc.

h. When there is a possibility, though but distant, that the secondary road, by connections or the increase of its own importance, must be changed sooner or later into a road with faster traffic, including mixed trains of various characters and speeds.

i. When it is possible that the secondary road may have to answer military purposes of any kind.

11 *b. Similarly, in what cases is the adoption of the narrow-gauge advisable, or equally so as the standard gauge?*

a. When, as is the case in Canada, East India, Australia, Norway, etc., the system of narrow-gauge roads is so extended and its own internal traffic so great, that the connections with adjoining systems of different gauge become comparatively unimportant, and the transfer expenses, etc., sink to a minimum amount when distributed over the total traffic.

b. When the traffic of the secondary roads is, in general terms, only raw materials or only passengers.

A mixed traffic, especially if composed of passengers, package goods and raw materials, makes the operation of the narrow-gauge costly, on account of the variety of the objects to be provided for.

c. When the reduction of the cost of construction attained by the adoption of sharp curves is so considerable that the interest on it outweighs, financially, all the economical advantages which the operation of the standard-gauge road has over that of the narrow-gauge road.

d. When the articles transferred are and will remain those whose reloading incurs no considerable expense, no reduction in value, and no risk. Among them is, as has been mentioned, scarcely anything except ores, timber, lime, materials for road construction, undressed quarry stone, and a few kinds of coal which are scarcely ever carried in Austria.

But if the traffic in such articles is from the main to the secondary road, then the methods of cheap transfer, dumping apparatus, etc., are hardly applicable, and the adoption of the narrow-gauge is no longer advisable.

e. When the nature and dimensions of the narrow-gauge cars make it practicable for them to penetrate to original source of the object to be carried—into the adits of mines, to working shafts, into quarries, pits, forests, etc.—so that they can transport their loads untouched thence to the point of transfer.

f. When a system of roads is completely isolated by natural barriers (on islands, where the only outlet is by water, etc.).

Still here we should proceed cautiously, as the example of the Swedish roads, cited above, shows.

g. When the country roads and highways can be used with great advantage as routes of secondary roads (as was the case with the Brōhlthal road), and the width and turns of these highways make the application of the standard-gauge too difficult and costly.

12. *In what cases is the adoption of the narrow-gauge system decidedly unadvisable?*

a. When a mixed traffic of passengers, package goods and produce makes it probable that, in accordance with experience, the working expenses of the narrow-gauge road will be so high that it will be difficult to meet them, and a suitable income on the capital of the road becomes almost impossible.

b. When many junctions with main roads may be necessary, or a system is so located that its change into a system of higher rank may be required.

c. When the requirements of the traffic vary greatly, so that provision for the maximum business must be made by a costly equipment, which in dull times must stand still, a non-productive and even wasteful property, since the narrow-gauge road is unable to send its cars over other roads.

If, in conclusion, we turn our attention to what actual results the numerous discussions, investigations and observations have led, which for more than half a generation have been made with regard to the gauge of secondary roads in all countries in Europe where railroads are highly developed, the quintessence of which we have spread before the public in the foregoing—if we turn our attention to these actual results, we find that in England the much studied Festiniog Railway has had no successor; that in Belgium the Antwerp & Ghent line not only has remained isolated, but will probably be rebuilt; that in the Rhine country, Westphalia and Upper Silesia the narrow-gauge system has had no extension for public service; finally, that in Sweden (which of all European countries has had opportunity to make the most experiments with the narrow-gauge system), the system has been abandoned on principle for all lines of mixed traffic.

Against the weight of these plain-speaking facts one weak voice is raised, that France, apparently, has here and there begun to construct narrow-gauge secondary roads, if even this phenomenon were the consequence of persuasion of the fitness of the system for the objects in question. But in fact, it is almost wholly an emanation from the tendency which prevails in the controlling circles, and which has come down from the Napoleonic *régime*, to protect the financial interests of the great "railroad monopolies" at any price, and even from the most remote possibility of competition, to which tendency is due a part of the regulations of the law of 1865 concerning railroads of local interest.

The new short narrow-gauge roads of Switzerland have arisen under circumstances for which we have had to designate them as most suitable under 11 *a* and 11 *b*.

It is not difficult to draw the proper conclusion from what has been said, and to apply it properly to the programme for the construction of secondary roads in Austria which has just been submitted. No technical knowledge is required for this, but only a sound understanding and a really honest purpose.

Both can and will be found in the controlling circles, and so it is to be hoped that Austria will remain secure against increasing by one the number of colossal experiments from whose success the welfare of this glorious country, in peace and war, is expected.§§§

*** The passenger cars which are almost universally used in Europe are supported on four or six wheels whose axles are fixed rigidly to the car-bodies, and the cars have their entrances at the sides, while the seats run entirely across the car, so that there must be a door (usually one on each side) for every two seats, which seats face each other.—THE TRANSLATOR.

††† A few Austian railroads run cars of the American system for local traffic, even on main lines. These would suit admirably for a long time yet for the working of secondary roads. One such car in the train, with compartments for the second and third classes, will in most cases fully answer all requirements.

‡‡‡ Weber: "Praxis," p. 117.

§§§ There follows a list of 55 different works and articles on narrow-gauge railroads, in German, English, French, Spanish, Italian, Norwegian and Swedish, which have been studied by the author, besides the notes of his personal examination of most of the light railroads of Europe.

Do the Railroads Discriminate against New York?

The following, which has been printed under the title of "Are New York Railroads Discriminating against the Commerce of this City?" is a reply made by Mr. Albert Fink to a letter received by him, in his capacity as Commissioner of the Trunk Lines, from a merchant who complained that the rates made and maintained were a discrimination against New York commerce.

NEW YORK, June 20, 1878.

DEAR SIR: In your letter of the 31st ult. you express the opinion that the merchants of New York were laboring under great disadvantage in competing with the merchants of other seaboard cities on account of the "distance discriminations" in the rates of transportation established by agreement of the trunk lines between the seaboard cities. You say, that "equal rates" should be made without regard to distance, and if this could not be otherwise secured, then a railroad war should be inaugurated by the New York roads against the Philadelphia and Baltimore roads, as the latter, you say, "have no right to dictate to the New York roads that the natural advantages of this port shall be abrogated." In concluding your letter you express the hope that I would use my influence in establishing "the principle that cost of transportation, and not distance, must fix the rate;" under this rule, you say, "New York is entitled to and must have equal rates with other seaboard cities."

The same or similar views which you here express are generally entertained by the merchants of this city. They have found expression in the official report of the Chamber of Commerce, in the press and at public meetings, and have fully taken hold of the public mind.

Believing, as I do, that these views are entirely erroneous, I propose to show in this letter why I cannot endorse, and, least of all, advocate the same.

I will first refer to the error which is so generally made in *assuming* that the present established differences in rates between New York, Philadelphia and Baltimore and the West were based upon distance only. If that was the case, these differences should be much greater.

Compare for example, from the figures given in the table on next page, the rates from New York and Baltimore to Cincinnati, as now established, with the rates from those cities to Cincinnati if they were based upon distance alone.

The distance from New York, by the shortest line over the New York Central Railroad, is 867 miles, and from Baltimore to Cincinnati, over the Baltimore & Ohio Railroad, is 579 miles, the latter being 66.8 per cent. of the former.

	Classes.				Average rate.
	1	2	3	4	
Rates from New York to Cincinnati as now established	70	55	46	37	53½
Rates from Baltimore to Cincinnati based upon distances being 66.8 per cent. of the rate from New York	47	37	31	25	36
Difference between New York rates and the Baltimore rates, based on distances alone	23	18	15	12	17½
Agreed difference between New York and Baltimore rates	8	8	3	3	5½
Excess of distance differences over "agreed differences"	15	10	12	9	12

From the above statement it will be seen that the average "*agreed difference*" in favor of Baltimore is 5½ cents per hundred pounds, while the "*distance difference*" to which Baltimore would be entitled is 17½ cents per hundred pounds, which is more than three times as much. Five and one-half cents difference on the average rates of all classes constitutes 10.3 per cent. of the average rates from New York to Cincinnati, while the difference in distance is 33.2 per cent. In other words, 22.9 per cent. of distance, or 198 miles, are entirely disregarded in the adjustment of rates; conclusively showing that distance alone is not made, as is supposed, the basis of the agreed differences.

Bearing this fact in mind, it must appear how unjust it is to reproach the New York railroads with allowing reduced rates to be made from Philadelphia and Baltimore, because these places are nearer to the West than New York, while they do not increase the rates from Boston, which city is 60 miles further, via New York Central, than New York.

When 198 miles are disregarded in the adjustment of rates in favor of New York as against Baltimore, New York has no right to complain if only 60 miles in distance are disregarded in favor of Boston as against New York. The unjust criticism made in regard to this subject is based upon the mistaken idea that the existing and agreed differences in rates were based strictly upon distances, when the fact is that distances do not form a controlling influence upon the establishment of competitive tariffs.

It is now proposed by you to substitute for distances the cost of transportation as the proper basis for competitive tariffs—a proposition no doubt suggested by the belief that if it were adopted, it would work more favorably to the interests of the city.

But cost of transportation depends upon distances, in a great degree, and it will be shown that this principle (as well as that of distances) cannot be made a controlling one, and if it could be made so, that it would be greatly to the detriment of this city.

According to the report of the New York Central Railroad for 1877 (see analysis of same in *Railroad Gazette*, of Jan. 4, 1878), the average cost of transporting a ton of freight per mile is $\frac{7}{10}$ cent; on the Pennsylvania Railroad it is $\frac{515}{1000}$ cent per ton mile. It is generally supposed that the Pennsylvania Railroad, passing through a more mountainous country than the New York Central, could not be so cheaply operated; but it is not generally known that only a small portion of that road has heavy grades, while on the greater portion of it more cars are being hauled in a train than the average on the New York Central road, so that the total number of cars hauled in a train over the whole length of road is about the same on both roads, while the Pennsylvania road possesses the advantage of cheaper fuel.

Applying the average cost of transportation on both roads, as given above, to the distance from Philadelphia to Chicago and from New York to Chicago, the cost per ton from Philadelphia to Chicago is $823 \times 0.516 = \$4.24$, or 21.23 cents per hundred pounds; and the cost per ton from New York to Chicago is $961 \times 0.70 = \$6.72$, or 33.63 cents per hundred pounds, showing a difference of 12.40 cents per hundred pounds in favor of Philadelphia; while the average agreed difference is only 4 cents per hundred pounds.

From points in the Southwest—St. Louis, Cincinnati—the difference would be still greater.

The cost per ton mile on the Baltimore & Ohio Railroad is not given in the report of that company, but from my knowledge of the conditions under which this road is operated, I feel warranted in estimating the cost as not exceeding 0.75 cent per ton per mile—about the same as on the Erie Railroad. To err on the safe side, I will assume it to be 0.80 cent per ton mile. In that case, the cost per ton from Baltimore to Cincinnati would be $579 \times 0.801 = \$4.63$, or 23.16 cents per hundred pounds, and the cost from New to Cincinnati $867 \times 0.70 = \$6.06$, or 30.35 cents per hundred pounds; the difference in favor of Baltimore being 7.1 cents, and the agreed average difference 5½ cents.

If the cost per ton was only 0.75, which I believe to be nearer the truth, the difference in favor of Baltimore would be 8.7 cents per hundred pounds.

Applying, therefore, the proposed new principle of establishing differences between seaboard cities upon the cost of transportation alone, this would be greatly in favor of Philadelphia and Baltimore and against the city of New York; showing that Messrs. Vanderbilt and Jewett, in making the present agreements with the Pennsylvania and Baltimore & Ohio railroads have done much more for the city of New York than you propose to do.

I have endeavored to show that in the establishment of competitive rates between seaboard cities, neither *distances* nor *cost of transportation* has had a controlling influence, and that if this had been the case, the difference in rates in favor of Philadelphia and Baltimore would have been very much greater.

The question now arises, what is the proper principle upon which these differences should be established? It can be readily shown that no principle whatsoever could be followed, the adoption of which would deprive one or the other city and its railroads from participating in the commerce of the country. If a tariff based upon cost of transportation would give to Baltimore and Philadelphia the whole of the carrying trade, and exclude New York from it, you would no longer advocate that principle, no matter how much your judgment might otherwise approve of it; nor would the cities of Philadelphia and Baltimore assent to it if the result of its application would be the concentration of business in the hands of the New York merchants. The conclusion to be drawn from this is, that no matter what other conditions may influence the establishment of railroad tariffs, they must all fulfill this one condition—they must secure to each of the competitors a fair proportion of the business. Whether this condition is complied with in any particular case, is to be experimentally ascertained, but cannot be decided beforehand upon any known abstract principle.

If under the operation of the present agreed differences in rates between the seaboard cities, business is diverted from one city to the other, a readjustment of these differences should be made. but the evidence showing that this unjust discrimination really exists must be of a positive character; mere general impression and guess work cannot be accepted as such. The fact that one of the hotels in this city has lost patronage, as cited in the report of the Chamber of Commerce, is no evidence that the difference in rates has brought about this result; and the fact that there has been a general reduction of business in this city is not alone sufficient proof of railroad discrimination. It must be shown also that this reduction in the trade of the city is directly traceable to these discriminations, and does not result from other causes, perhaps of a general character, that have no connection with the transportation rates.

Nor are isolated instances of reduction in rates in other cities, below the established tariff, sufficient evidence of discrimination against New York, especially when it is known that similar reductions are perhaps to a greater extent made in this city.

Nothing but direct information as to the amount of business transacted in the different cities during certain periods of time, during which certain known differences in rates were prevailing, could be considered as proof of the fact that the tariff is operating unjustly to one or the other city.

Take, for example, the receipt of grain in the city of New York for the first five months of this year, as compared with corresponding months of last year. Of the total shipment made from the West to the seaboard this year, New York received 45 per cent., and last year only 32.5 per cent.; Philadelphia and Baltimore this year, 36.2 per cent.; last year, 44 per cent. This does not show that the difference in rates prevailing this year has operated injuriously against New York. It is information of this character which should be collected and analyzed, in determining whether the agreed differences in rates are objectionable.

When facts are presented to the managers of the New York railroads, showing that this city is *really* suffering from discriminations in tariff, you need not entertain the least fear that they will not *do all in their power* to remedy the complaint. They are as much interested in so doing as any merchant in the city. I do not, at present, propose to decide the question whether the present prevailing differences are just to all the seaboard cities or not. What I intended to do was, to show the conditions really controlling the establishment of railroad tariffs from competing cities, and the manner in which such questions have to be dealt with.

It is, however, one thing to establish proper principles, and another thing to carry the same into effect. One or the other of the seaboard cities or trunk lines may be dissatisfied with the present compact, but any one of the trunk lines cannot change the difference to suit itself; the voluntary coöperation of all is absolutely necessary to establish any fixed tariff at all.

This is a fact that is not generally appreciated by commercial men. Here, in New York, it is supposed that Mr. Vanderbilt had merely to say what the rates should be from the seaboard cities, and they would be made so. The fact is, that in regard to such questions, neither Mr. Vanderbilt nor Mr. Jewett can dictate terms to Mr. Scott and Mr. Garrett, nor *vice versâ*. All that they can do, in case of inability to agree, is to inaugurate a war of rates, and it is this plan which you recommend in case Mr. Vanderbilt cannot have his own way—or rather your own way.

I differ with you greatly as to the expediency of warfare between the trunk lines. War between railroads is of an entirely different character from war between steamboats. In the latter, the party having the most money wins in the end; or, in a war between two nations, the stronger must, in the end, prove victorious, and can dictate terms of peace, which settles the question at issue for the time being. It is otherwise with wars between railroads. The party that is the weakest is the most formidable as an enemy. It has nothing to lose. A railroad is never exhausted or obliterated; it always will be operated.

If the New York Central road could bankrupt all the other trunk roads, the latter would only be in a better condition to bankrupt the New York Central. And, after all this had been accomplished, the identical question that led to the war would still remain unsettled.

It will readily occur to you that, in case a war is undertaken by Mr. Vanderbilt for the purpose of reducing the present differences in rates, the Philadelphia and Baltimore roads can charge less than the New York roads, as long as the New York roads charge anything at all.

Mr. Vanderbilt is, therefore, right when he says, in his letter to the Secretary of the Chamber of Commerce, dated April 18, 1878, "Such a contest would permanently injure the roads, derange all business during its continuance, and result in no good in the end."

The fact is, the merchants of New York should, least of all others, desire a railroad war. It injures the interests of this city more than those of any other party affected by it. While the railroads themselves would, no doubt, all suffer, yet the other seaboard cities—Baltimore, Philadelphia and Boston—would be benefited at the expense of the city of New York.

A war between the trunk lines means low rates of rail transportation. It is to the interests of this city to have the rail rates kept reasonably high to and from New York, and consequently, under the present agreement with the Philadelphia and Baltimore roads, to and from the latter cities.

If rail rates, during a war, are made so low as to approach the canal and lake and rail rates, then the advantages of the canal are entirely lost to this city. For all practical purposes, the canal might as well be filled up.

When the rates from Chicago to New York by rail are 30 cents per hundred pounds, or, say 18 cents per bushel of wheat, the rates to Baltimore are 27 cents, or 16.2 cents per bushel. But if the rate from Chicago to New York is 15 cents per hundred pounds, or 9 cents per bushel of wheat, the rate to Baltimore would be made 12 cents per hundred pounds, or 7.2 per bushel. Baltimore, therefore, secures the same rate as charged *via* canal, and its merchants enjoy the same benefit as if the canal were directly built to that city.

During the railroad war in 1876, New York city received a smaller percentage of the total grain shipped to the seaboard than it has received during the years from 1868 to 1877.* With such facts before us, I feel sure that the people of New York, least of all others, should become advocates of railroad wars; indeed, they should use their best efforts for their prevention.

I have already extended this communication too much, although I do not know how I could treat a subject of vital importance to the city of New York, and apparently so little understood, in less space.

Before concluding, I have to refer to another complaint which is usually made against the New York roads, namely, that, while they allow reduced rates from Philadelphia and Baltimore to the West on account of shorter distances, they allow reduced rates from Boston on account of the longer distances.

Stating the case in this way, it seems absurd enough; but, when the facts are fully understood, it will appear that this statement is made under misapprehension. I have already shown that distance is not a *controlling* element in rates, and that sixty miles of increased distance from Boston to Cincinnati may be overlooked *against* New York, when 198 miles in distance between Baltimore and Cincinnati are overlooked *in favor* of New York.

While this may explain why rates from Boston and New York are the same, it does not explain why the Grand Trunk Railroad is allowed to make lower rates *via* that route than are made *via* the other routes from Boston.

This is done because the Grand Trunk could not secure any business at all if it were obliged to maintain the same rates with other roads, for reasons well known, and not necessary here to detail. It would be absurd to demand that the Grand Trunk should retire from the business altogether. Such a demand, if made, could not be enforced, for the same reason that a demand on the Philadelphia and Baltimore roads by the New York roads to abolish all differences in rates could not be enforced.

The shipper who ships over an inferior route (whether that route is really inferior or he believes it to be so in his judgment) requires compensation, and the difference in rate allowed to the inferior route constitutes this compensation; so that practically the lower rate must be considered equal to the higher. It requires no argument to prove, that if the Grand Trunk road possessed the same advantages as the New York Central road, the difference in rate made by the Grand Trunk in Boston would secure to it the *whole* of the Boston business, while it really only gets a small portion of it—about 16 per cent.

It is, therefore, not true, taking into consideration the facts just stated, that Boston enjoys lower rates of transportation than New York—an impression that seems to have been created by the late discussion of the transportation subject in this city. Strange to say, the fact has never been mentioned, or has been entirely overlooked, that the city of New York enjoys precisely the same advantages in this respect as Boston, if it be considered an advantage.

The Grand Trunk Railroad is taking freight out of New York, *via* Portland, at lower rates than the rates established by the trunk lines. If we are to believe the papers, a very large amount of freight has thus been shipped at rates even less than those *via* the Grand Trunk from Boston.

The Chesapeake & Ohio Railroad charges less from New York than the established trunk line rates. It has a circuitous route to the West *via* Richmond, as the Grand Trunk has a circuitous route *via* Portland and Montreal. On account of these longer routes, lower rates are granted—not because they are longer, but because no tariff can be maintained that does not give a portion of business to every competing line.

An agreement has also existed for years between the trunk roads and the Southern transportation lines from New York *via* Norfolk, Sabannah and Charleston, according to which the latter are to charge, to competing points, less than trunk-line tariff. These differences range from fifteen cents per hundred pound, on first class down to five cents per hundred pounds on fourth class, and are to compensate the shipper for the disadvantages of these routes as compared with the trunk-line routes.

The same principle that regulates these matters in New York is applied in Boston. The charges against the New York roads of unjustly discriminating against this city are, therefore entirely without foundation.

I have not yet mentioned, in connection with this subject, another important fact that seems to be never mentioned when the disabilities of New York as a commercial city are made the subject of discussion.

During the season of navigation rates are made from New York, *via* rail and lake, 33 per cent. lower than any rates that can be made from Baltimore under the present agreement. The rates made *via* canal from New York are more than 50 per cent. lower than the established trunk-line rates from the other seaboard cities, and the shipments of freight *via* canal from New York amount to 40 per cent. of the total rail shipments to the West from New York during similar periods of time. No other seaboard city can avail itself of such cheap transportation rates to and from the West. With all these advantages in favor of New York, and so many more of a different character, not necessary here to mention, should the merchants of this city not be able to compete with those of other cities?

Whether this question is answered with yes or no, one fact is plain enough—that this city has given up none of its natural advantages to Philadelphia and Baltimore by any act of its railroad managers, or, as far as I know, by the acts of any one else.

It is therefore not necessary to insist that "the other roads (meaning the Philadelphia and Baltimore roads) have no right to dictate to New York that the natural advantages of this port shall be abrogated."

If closer proximity to the markets of the West, and cheaper rail transportation in consequence thereof, are considered as constituting the natural advantages of a port, surely Philadelphia and Baltimore have yielded some of these advantages in favor of your city, but you have yielded none to them.

Whatever advantage has been gained by New York has been secured by the efforts of the New York roads alone, without aid from the merchants of this city. Nevertheless, the impression is sought to be created that these New York roads are the worst enemies of the city, and that they attempt by unjust discrimination to destroy its commerce.

In the report of the Chamber of Commerce, of February last, copies of tariff are published which was issued, as therein stated, in November, 1875, showing a discrimination of 25 to 133 per cent. in favor of Boston, Philadelphia and Baltimore. I do not know whether this tariff was ever in force, but it is well known that no shipments have been made under it since the spring of 1876, and the present tariff, which took effect in the spring of 1877, shows a reduction of 15 to 123 per cent. upon the differences named in the above mentioned report. These reductions were made after a "long and desperate struggle," as Mr. Vanderbilt says, in his letter already referred to. Yet not a word of commendation is spoken for achieving so much for this city, and all that was possible to achieve.

The publications lately made in this city, proclaiming to the world the commercial disabilities under which this city is supposed to labor, and which, I think, do not really exist, and advertising the advantages of other cities, cannot but prove a disadvantage to New York, as people at a distance may be misled thereby. It is, therefore, important that no unjust charges and criticism should be made against the railroads, and to avoid that it is necessary that the merchants of this city should fully understand the difficulties and complications of the transportation business.

It is natural enough that they should see only that which is desirable to them to obtain, but do not understand what is possible or practicable to secure. They judge these matters from their own standpoint, and do not consider that like claims as theirs are made by other commercial communities, with like rights to have them considered.

Railroad managers are constantly made aware of and come in contact with these outside forces, which they cannot control, and must be content with securing only that which is practicable and possible to secure in their battles with other interests.

Hence the apparent diversity of opinion and judgment between railroad managers and the commercial community with which the railroads are identified, and the antagonism which we find almost always existing between the two parties, although they are both working for the very same object.

The appointment of the Transportation Committee by the Chamber of Commerce, for the purpose of collecting information and to confer with the railroad managers in regard to transportation matters, is a step in the right direction to allay this antagonism; provided, however, that such investigations are made in a spirit of fairness, and not under a predetermined conclusion to find fault; and provided, also, that sufficient time is devoted to studying the subject in all its widespread ramifications.

It is with the intention of assisting to a better understanding of the transportation problem that I have written this letter, which I desire to be considered as testimony in addition to that which I have already given before the Committee of Transportation of the Chamber of Commerce. The position I hold does not connect me with the interest of any one of the trunk lines, or of any one of the seaboard cities. This enables me, I think, to take, perhaps, a more impartial, and I may say a more comprehensive view of these questions; at least I do not feel guilty of entertaining any partisan views in favor of one or the other interests; all that I would desire to see is that the transportation subject should be thoroughly understood by all parties. When this is accomplished the greatest difficulty has been removed in the way of solving the transportation problem.

In conclusion, I will call attention to the agreement which has now existed between the four trunk lines since July 1, 1877, and to which the Grand Trunk Railroad became a party on the 1st February last. This agreement has for its object the maintenance of reasonable and fixed tariff rates from all seaboard cities upon agreed differences, and to make the rates alike for all shippers, without discrimination and favoriteism.

It is only by combinations between all the railroads and by their coöperation that these results can ever be secured to the public. They cannot be secured by discord, strife and war.

As far as the trunk lines themselves are concerned, they have strictly adhered to the agreement, but some of the numerous Western connections have not, and hence the operation of the plan has not been perfect. Whatever influence, however, it has been in the power of the trunk lines to exercise upon their connections has been exercised, and upon the whole the result must be considered satisfactory, bearing in mind the difficulties and complications of the problem to be solved. Perfection, if at all attainable, could not be reached in so short a time. As confidence is established between railroad managers, the difficulties of the problem will be lessened. I think that all commercial communities are interested in this matter, and should lend their support to the trunk lines in the difficult task which they have undertaken, to maintain reasonable rates of transportation without constant fluctuations and without unjust discrimination.

Respectfully yours, ALBERT FINK.

* See *Railroad Gazette* of April 5, 12, 19, 26, 1878.

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EDITORIAL ANNOUNCEMENTS.

Passes.—*All persons connected with this paper are forbidden to ask for passes under any circumstances, and we will be thankful to have any act of the kind reported to this office.*

Addresses.—*Business letters should be addressed and drafts made payable to* THE RAILROAD GAZETTE. *Communications for the attention of the Editors should be addressed* EDITOR RAILROAD GAZETTE.

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies, the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

THE RESISTANCE OF RAILROAD CARS.

As long ago as 1838 Mr. Nicholas Wood in his "Practical Treatise on Railroads" wrote: "It has long been a matter of just regret that so few experiments have been made to ascertain the degree of resistance arising from friction to carriages moved along railroads. On a subject of such importance it is astonishing that, until lately, so little interest should have been excited, comprehending, as it were, the entire basis of the subject." As late as 1876 Mr. John Wolfe Barry, in his excellent little book on "Railway Appliances," wrote: "It is much to be wished that some of the great companies would set on foot careful experiments with a good dynamometer and well devised self-recording apparatus, placed between the engine and the train, to determine these and many other interesting matters connected with the traction of trains. There can be little doubt that the knowledge gained by such an investigation would be of the highest value, and would amply repay the cost and trouble of the investigation."

Thus, nearly forty years ago, one of the most noted railroad engineers was led to point out the ignorance which at that time existed in relation to this important subject, and one of the latest writers within a year or two is obliged to repeat the first regret. Has then nothing been done in all this time? On the contrary, any one who will take the trouble to search the current literature between those two periods, will find a very great quantity of records of experiments made by different persons at different times. A mere reference to them would almost fill a column. Doubtless, many other experiments have been made which have never been published. Any one who will study this subject will find that, notwithstanding all the experiments which have been made, the information which can be obtained from them is still of the most meagre kind, and he who seeks an answer to the question, how much is the resistance increased by a curve of a given degree or radius, will find, as some genius expressed it, that the best he can do is to "figure a little and then guess" at the answer. The general barrenness of the investigations is a little singular. In fact, most persons who first take up this subject are quite certain that if they only had the opportunity of applying a dynamometer to a train, they would be able to answer some of the knotty questions at once. A little experience, however, is apt to disabuse their minds of this idea. In Pambour's "Treatise on Locomotive Engines," dated 1836, the author says: "The most natural means of determining the friction or resistance of the wagons seemed to be the dynamometer, which gives directly the force of traction required to execute the motion. * * * * We expected to see the index of the balance remain nearly steady; but we were disappointed. Its average position was near the point marking 100 lbs.; but it underwent very great variations, that is to say, from 50 lbs. at least to 170 lbs. at most; and even two or three times, at certain extraordinary starts of the engine, the needle ran to the end of the balance, marking 220 lbs. * * * * After having, to no purpose, waited to see whether the motion would become more regular, we concluded that the experiment was not susceptible of a greater degree of precision." Thus Pambour, nearly half a century ago,* recorded the same experience which probably nearly every inquiring master mechanic and railroad engineer has acquired for himself at some time or other. After finding that the indications of an ordinary dynamometer varied so much, Pambour abandoned its use, and made a number of experiments with wagons which were allowed to descend an incline to a level portion of a track, and then calculated the resistance. In fact, a great variety of methods have been employed in making experiments on the resistance of trains, which makes it perhaps the more remarkable that some more reliable results have not yet been obtained. Any one in search of the information will look in vain to find out with any degree of certainty the resistance of ordinary American double-truck cars on a straight and level track at different speeds; the effect on the resistance of different degrees of curvature; the effect of spreading the wheels on the resistance on curves, and lastly we have a new inquiry—the effect of increasing the diameters of the wheels and also the length and diameter of the journals. Simple as these questions appear, their determination is not easy. Even on a straight and level track, it is difficult to get up and maintain a given speed without either increasing or diminishing it, which suggests that in order to make such experiments satisfactorily a speed-recorder of some kind must be used. Pambour's experiments, and a very little experience with any ordinary form of dynamometer, will show that such an instrument must be self-recording, otherwise it will be impossible to do more than make shrewd guesses at its indications. It is also necessary to have a correct profile and map of the road on which the experiments are made, in order to know to what causes the indications of the dynamometer are attributable. Unless the localities of the road are distinctly marked by mile-posts or some other means, it will be impossible to know certainly when a given point indicated on the map or profile is reached. Then, too, there are innumerable sources of error growing out of the inaccuracy of the mechanism or from its disarrangement, which must be watched in the most careful way; and, after all, the success and accuracy of the records obtained will depend largely upon the skill with which the machinery employed is designed and constructed. Besides all these difficulties, there is the fact, too, that the ability to make experiments, note the results with unerring and unswerving accuracy, and then reason correctly about them, is exceedingly rare, and requires a very high order of mental and, it may be said, mechanical qualifications. It is believed, too, that few of those who have undertaken the construction of a self-recording dynamometer have realized the mechanical difficulties in the way, or, what is worse, have had little or no training or experience in doing that kind of work. It may be said that the design and construction of a reliable and accurate self-recording dynamometer and speed-recorder combined is one of the most difficult problems which a mechanical engineer can undertake. In constructing the speed-recorder which was illustrated in the *Railroad Gazette* of Oct. 6, 1876 (page 481), we know that the skill and ingenuity of so able a mechanical engineer as Mr. George Westinghouse was tested quite as much if not more than they were in the invention of his brake. One of the chief reasons why the experiments on train resistances have not been more fruitful of an increase of knowledge is owing to the imperfection of the instruments employed. Few persons ordinarily would consider themselves competent without special training in the art to make a platform scales to weigh pig-iron correctly, and yet there have been numbers of persons who would doubtless acknowledge their inability to make a comparatively rude weighing machine of this kind who have undertaken the design of instruments the manufacture of which is a matter of much greater difficulty and the indications far more delicate.

Another reason why our knowledge of the resistance of American rolling stock is so limited, is that all the experiments made in Europe have been made with rolling stock different from that in use here, and therefore no conclusions can be drawn from such investigations which would be safe to apply to our American cars.

In most of the experiments, too, it seems as if there were a lack of analysis of the different elements which make up the tractive resistance of cars. Wood, in 1836, tried to determine how much of the resistance was due to the rolling of the wheels, how much to the friction of the journals, and how much to that of the flanges of the wheels, and also to the resistance of the atmosphere acting against the cars. In very few of the experiments that we know of have these been separately analyzed. In ordinary rolling stock a large part of the resistance must be due to defective workmanship, to wheels of unequal diameters, to axles which are not parallel, to unoiled centre-plates or side bearings, which will not permit the trucks to turn excepting with great difficulty. An analysis of these would probably be very fruitful of the kind of information which is needed, and which would help us to improve the construction of rolling stock.

From what has been said, it will be seen that to make an experimental investigation of this subject which will be at all thorough, in the first place there must be constructed an instrument which will make a correct record. Those who imagine that this is a matter that can be intrusted to any ordinary mechanic will find that they are grievously mistaken. There is no pooling arrangement of any kind whatsoever, whether of a committee appointed or of a combination of those high in authority, which can effect the desired result. Unless such experiments are devised and conducted by a person having a large amount of mechanical ingenuity, combined with a clear head and sound judgment, they will probably not have much value, and will not supply the information which all railroad engineers now feel is so much needed. If the services of such a person could be secured, in the language of Mr. Barry, "there can be little doubt that the knowledge gained by such an investigation would be of the highest value and would amply repay the cost and trouble of the investigation."

* The first edition of the book appeared in French in 1835.

WEBER ON RAILROAD GAUGES.

We publish this week entire a translation of Baron von Weber's popular pamphlet, which in the original is entitled "Standard Gauge and Narrow Gauge," and which is devoted entirely, however, to a discussion of the fitness of the different gauges for a certain kind of railroads only—what in Germany are usually called "secondary railroads," and in France "railroads of local interest." These roads are understood to be not only roads of light traffic, but roads on which the *quality* as well as the quantity of the work is different from that of the main lines. That is, it is there considered that the trains on the roads which can yield but a small profit per mile must be slower as well as fewer than those on main lines. This is a matter not sufficiently considered in this country in the discussions of cheap railroads. In the discussions, we say, for it is considered in practice quite fully. Almost universally the very cheap railroads, of whatever gauge, are worked at low speeds, and must be worked at low speeds if they are to be safely or economically worked. The mistake is in not considering this matter of speed sufficiently when the roads are planned, and in not recognizing the fact that very low speeds, compared with those of main lines, are amply sufficient for most branch roads with thin traffic, and that there is an enormous saving in the cost of construction by adapting them for such moderate speeds. Too generally, the village eight or ten miles from a railroad which purposes the construction of a branch, which will have to be supported almost entirely by that single village, expects to have similar trains and speeds to those of the main line. It has now perhaps a coach once or twice each way daily running at a speed of about six or seven miles an hour, and freight brought in wagons at irregular intervals at less than half that speed. It seems not to be considered that a speed of ten, twelve or fifteen miles an hour, with regular trains two or three times a day each way, will be an immense improvement on the old order of things, and one which perhaps the village will be able to pay for, but the desire is to leap at once from the stage-coach to the fast express and to obtain for

the village what is made possible on the main line by the concentration of the traffic of scores of such villages and several great cities. Now it is not often that these ambitious designs can be carried out, but it is quite common that the branch road is begun as a road for fast traffic, with many of the appliances which speed requires, but for want of means is completed so imperfectly that only a very moderate, though still, perhaps, perfectly adequate, speed can be permitted.

The "secondary road" of which Baron von Weber speaks, then, is a light road, a cheap road, and a road on which trains are not expected to run much faster than from seven to twelve miles an hour; though there may be, and should be, a great many grades of such roads, beginning with those on which the lowest economical speed is used, and going up until the distinction between the "secondary" road and the ordinary railroad is but just distinguishable. The requirements to be fulfilled in regard to quantity and quality of traffic are almost infinite, and it is desirable that in every particular case the provision made for transportation be as nearly as possible suited to the probable requirements—which is probably more nearly the case in this country than in any other, the mistakes here being most frequently due to a miscalculation of the requirements, a miscalculation which has more than once put a heavy railroad, or more than one, where none—not even a light one—was needed.

The work of Weber here presented is wholly popular in its character, citing very few figures and facts in evidence of the statements made; but it is as far as possible from being an *a priori* argument—a deduction from general principles made by the mind of the author. For the work is only a popular expression of facts ascertained by observation and experience and set forth at length in other longer works of the author, addressed to the engineering profession. And perhaps no man living has taken greater pains to arrive at the facts—to learn just what the experience with light railroads of different gauges has been in Europe. It must be borne in mind that narrow-gauge railroads are not a novelty there. There is a considerable number of them more than twenty years old, including one of the very first railroads built in Belgium. The novelty is not in the roads but in the wide-spread advocacy of their narrow gauge in recent years. In Weber's list of materials and in preparing this pamplet, after naming the 55 different works examined, he cites the following investigations of his own:

"Visit to and study of the Norwegian narrow-gauge roads, July, 1865.
"Second visit to and study of the extended system of the Norway roads, August, 1873.
"Visit to and study of the Swedish standard and narrow-gauge roads, August, 1868.
"Second visit to the same roads, August, 1873.
"Visit to and study of the Festiniog Railway, in July, 1870, and August, 1872.
"Visit to and study of the Antwerp & Ghent Railroad, August, 1872.
"Many observations of the Bröhlthal Railroad in several years."

In his work on "Experience with Secondary Railroads in Europe" he has described these and most of the other narrow-gauge railroads then existing in Europe, their rolling stock and the results of their operations quite minutely and with full statistics, and in it he bases all his statements on the actual experience of these roads as they were, and not on what they might, could, would or should have been.

We mention this because in this country, where the eminent author is not very widely known (his elaborate "Experiments on the Stability of Permanent Way" were translated and published in *Engineering* and the *Railroad Gazette*, and are pretty well known to American engineers as the most complete investigation of that subject), it might be supposed that his convictions on this subject, like those of too many other persons, were the result of prejudice, or of "reasoning from general principles," instead of being founded upon observation and experience.

As to the regard paid to Baron von Weber's views on this subject in Germany, it is enough to say that when, a year or more ago, it was proposed to encourage the construction of a great number of local railroads, to be cheaply built, in Prussia, largely to be undertaken by the municipalities assisted by the government of the Kingdom, he, then a resident of another empire, was called upon to prepare a general report on the subject, which has since been published in a pamphlet; and afterwards he was called to a position in the Prussian Ministry of Trade, where he is to supervise the establishment of this system of secondary railroads, which will probably be greater than any now existing. It is evident, then, that the author's name carries weight where he is best known, and that he is regarded especially as an expert in the particular subject which he has here treated.

The difference between the methods of construction of railroads, and especially of their equipment, in Europe and America is such as to make some statements of Weber's discussion entirely inapplicable in this country. This is especially true of the practicable limit of the radius of curves. The statement of the Swedish engineers that where curves need be of no smaller radius than 1,300 ft. the cost of road construction is substantially the same for the standard and the narrow gauges is in this country equivalent to the statement that nowhere need there be a difference in the cost; for curves of a quarter of that radius can be found on many standard-gauge roads here, and, as we have said in a foot-note, the largest traffic in America, some 600 trains daily, is over a railroad of standard gauge (the Metropolitan Elevated, in New York city), with curves of only *ninety* feet radius.

There are some other statements in the work translated which deserve extended comment, in order to show their applicability or inapplicability to American practice, but circumstances have made it impossible at this time. It is given as the expression of one of the ablest, most experienced and best informed of European engineers and railroad men on a subject which had there become one of the greatest practical importance, after a most thorough examination of the facts of experience on nearly all the narrow-gauge roads which have been long in operation.

Grain Receipts at the Atlantic Ports for Six Months.

The receipts of grain at the seven Atlantic ports for the six months from January 1 to June 29 have been for two years:

	1878. Bushels.	1878. Per cent. of total.	1877. Bushels.	1877. Per cent. of total.
New York	49,093,569	45.5	19,928,306	35.5
Boston	8,401,030	7.8	5,715,583	10.2
Portland	1,411,621	1.3	702,793	1.3
Montreal	3,751,777	3.5	2,675,282	4.8
Philadelphia	19,777,810	18.3	8,317,040	14.8
Baltimore	17,896,500	16.6	14,213,084	25.4
New Orleans	7,597,648	7,0	4,501,487	8.0
Total	107,929,955	100.0	56,053,575	100.0

There having been an increase of 92.6 per cent. in the aggregate receipts, there may be a large increase at any one port while it yet has lost rank in the list of grain receivers. This is the case with Boston, Montreal, and New Orleans, and especially with Baltimore, which, to have kept its last year's rank, with 25.4 per cent. of the total receipts, should have had this year 27,400,000 bushels of grain, instead of the 17,900,000 which it actually received. Its increase in receipts was as much as 28 per cent., but Philadelphia's was 138, and New York's 146 per cent.

The very large increase at Philadelphia is more remarkable than that of New York, as it is not affected to anything like the same extent by the exceptionally long season and low rates of navigation. And it is noticeable that the very large gains of Philadelphia have been made since rather than before the opening of navigation. For instance, in the month of May the aggregate receipts of the seven ports were almost exactly 100 per cent. greater this year than last; but Philadelphia's increase was then more than 300 per cent., while New York's was less than 90 per cent. It would appear that the Pennsylvania Railroad has accepted all the grain it can get at the very low rates prevailing, and that the Baltimore & Ohio has been declining the business as unremunerative, and the New York roads have been leaving the grain chiefly to the lake route, as the great bulk of the receipts at New York is by canal, and a very large proportion of that delivered by rail is taken by the trunk lines at Buffalo from lake vessels—as doubtless is a considerable part of that delivered at Philadelphia taken from propellers at Erie by the Pennsylvania Railroad.

Compared with Baltimore and Philadelphia taken together, the proportion of New York appears as follows:

	1878.	1877.
New York	45.5	35.5
Philadelphia and Baltimore	34.9	40.2
The three markets	80.4	75.7

Last year New York received an eighth less than Baltimore and Philadelphia taken together; this year it has received nearly a third more than they.

Putting New York and Boston together as against Philadelphia and Baltimore, we have the following percentages.

	1878.	1877.
New York and Boston	53.3	45.7
Philadelphia and Baltimore	34.9	40.2
Total	88.2	85.9

As every place is sure of a considerable amount yearly for domestic consumption, and some receive chiefly for that purpose, we will best ascertain the success of the different cities in attracting business for which they really compete, by comparing the proportions of the *increased movement* which they have severally got. Now

	Bushels.
The aggregate increase at the seven ports has been	51,876,380
Of this increase New York has received 56 per cent., or	29,165,263
" " Philadelphia " 22.1 " "	11,460,770
" " Baltimore " 7.1 " "	3,683,416
And Baltimore and Philadelphia together have received 29.2 per cent. of it, or	15,144,186

This certainly should be satisfactory to New York, which has received, in the half-year, a considerably larger *quantity* of grain than ever before, a much larger *percentage of the total* than last year, or previous recent years, and of the increase of the grain crops, which is largely available for export, has received 56 per cent. of the whole, while its two chief rivals together got but 29 per cent. of it.

Fast Time.

Probably the fastest time ever made by regular trains in this country is now made between New York and Philadelphia. The new line, made up by the Central of New Jersey, Delaware & Bound Brook and North Pennsylvania, runs one train between the two cities in two hours and five minutes, including the ferry crossing of the Hudson River. The running time for the 88 miles from Philadelphia to Jersey City is one hour and 56 minutes, the train stopping at Trenton Junction and Bound Brook, and also for the grade crossing at Elizabeth. The corresponding train from New York makes the run in two hours and five minutes, with the same stops. The Pennsylvania runs its fast train from West Philadelphia to Jersey City, 89 miles, in one hour and 54 minutes, the return train making the trip from Jersey City to West Philadelphia in one hour and 50 minutes. These trains stop at Trenton and for the grade crossing at Elizabeth, and are also obliged to reduce speed over the Trenton bridge, and for nearly two miles passing through the city of Newark. Special trains have made as fast or faster runs, but we do not think that an average speed of 48 miles an hour has ever before been required by regular time-tables in this country.

Record of New Railroad Construction.

This number of the *Railroad Gazette* contains information of the laying of track on new railroads as follows:

Lehigh & Susquehanna.—The *Drifton Branch* is completed from Drifton Junction, Pa., westward to Drifton, 11 miles.

Worthington & Sioux Falls.—Extended from Beaver Falls, Minn., westward to Valley Springs, Dak., 6 miles.

Cincinnati & Eastern.—Extended from Batavia Junction, O., westward to Miami Valley Junction, 5 miles. It is 3-ft. gauge.

Southern Minnesota.—Extended from Winnebago, Minn., west by south to Fairmont, 18 miles.

Pittsburgh & Lake Erie.—Extended from Mahoningtown, Pa., southeast to Beaver Falls, 12 miles.

Chicago, Milwaukee & St. Paul.—The *Hastings & Dakota Division* is extended from Glencoe, Minn., west to Lake Addie, 11 miles.

Utica & Black River.—Extended northeast to Ogdensburg, N. Y., 4 miles.

Peterboro & Hillsboro.—Completed from Peterboro, N. H., northward to Hillsboro Bridge, 18 miles.

This is a total of 85 miles of new railroad, making 691 miles completed in the United States in 1878, against 689 miles reported for the corresponding period in 1877, 740 in 1876, 426 in 1875, 690 in 1874, and 1,518 in 1873.

THE OFFICERS OF THE VANDERBILT RAILROADS—New York Central & Hudson River, Lake Shore & Michigan Southern, Canada Southern, and Michigan Central—were holding a conference in Saratoga on Tuesday and Wednesday of this week, and as is usual when two railroad men get together, some have inferred that some deep-laid plot is being planned. As we write no results have been reported, but the holding of the conference seems the most natural thing in the world, in view of the fact that the Michigan Central, which hitherto has been the most active, vigorous and successful competitor of the Lake Shore, has recently come under the management of the President of the latter road. Certainly it is now Mr. Vanderbilt's duty to see that these two companies entrusted to his care no longer attempt to cut each other's throats. The four roads must work together harmoniously now, and it is desirable to provide some simple method for securing harmony, and putting an end to the costly machinery by which two of them at least have been working against each other. An agreed distribution of traffic from competing points between the Michigan Central and the Lake Shore would seem to be a rational settlement of the question, so far as they are concerned. It remains to decide what shall be done with the Michigan Central traffic between Detroit and the New York Central. The Canada Southern could easily find room for it all, but the old chief connection of the Michigan Central, the Great Western, cannot be ignored, nor can the Grand Trunk.

Although the conference so far is one purely of the Vanderbilt roads, it is not at all impossible that, having settled their relations with each other, they may invite their competitors to confer with them with regard to the business for which these now united Vanderbilt roads compete with them. Indeed, it is reported that managers of some such competing lines have been invited to Saratoga already.

The thing desirable is to make an effective distribution of the east-bound traffic, and if one is proposed and accepted by the Vanderbilt roads the general opinion seems to be that there will be no serious difficulty in carrying it out.

AN ADVANCE IN EAST-BOUND RATES is reported to have been agreed upon in Chicago about the end of last week, and what does the reader suppose this "advanced" rate to be? Why, *sixteen cents* per 100 lbs. from Chicago to New York for grain, and 18 cents for fourth class and provisions! This is at the rate of about 0.351 cent and 0.395 cent per ton per mile by the shortest route, and of 0.333 cent and

0.365 cent by the route by which most of the freight reaches New York. The rate to Philadelphia, as usual, is two cents lower per 100 lbs., but the rate to Baltimore, it is noticeable, is not made three cents lower, but the same as the Philadelphia rate. By the agreement of December, 1876, the Baltimore & Ohio Railroad has the privilege of making the Baltimore rate on east-bound freight three cents per 100 lbs. lower than the New York rate. It seems that this "privilege" it does not care to exercise when it would make it take grain 884 miles for 13 cents per 100 lbs. At these rates the question fs as to the amount not of profits but of losses.

THE USE OF STEAM ON STREET RAILROADS is expressly provided in a number of bills for roads of that kind, which recently passed the House of Commons in the British Parliament by a very large majority. The committee which reported these bills said that they had made careful examinations and taken much evidence, and the testimony was overwhelming in favor of the safety and public advantage of steam in the streets. The bills limited the maximum speed to eight miles per hour in the towns, and ten in the country.

LAKE AND CANAL RATES remain as they were a week ago. 1⅝ cents per bushel for wheat, and 1¼ for corn from Chicago and Buffalo, and 4¼ cents for wheat and 3¾ for corn from Buffalo to New York—the lowest rates ever known. At Chicago a through rate for corn by lake and canal to New York is reported at 5¾ cents, and iron ore is taken to Lake Erie ports from Marquette at $1, and from Escanaba at 60 cents per ton.

Missouri Freight Rates.

The rates on the special classes of freights provided for by the Missouri law are announced as follows, in a circular issued by the Missouri Railroad Commission under date of June 25. The rates as fixed, took effect July 10:

MILES.	D.	E.	F.	G.	H.	I.	J.
	100 lbs.	bbl.	bbl.	car.	car.	car.	car.
25	6c.	12c.	15c.	$8.00	$10.00	$11.00	$8.00
50	10	20	21	13.00	14.00	17.00	10.50
63	11	22	22½	14.50	16.00	18.50	11.00
73	12	24	24½	15.00	18.00	20.00	12.50
88	13	28	26	16.50	20.00	21.50	13.00
100	14	38	28	17.00	22.00	23.90	14.00
113	15	30	29½	18.50	23.50	24.50	15.00
125	16	32	31½	19.00	25.00	26.00	16.00
138	17	34	33	20.50	26.50	27.50	17.00
150	18	36	35	21.00	28.00	29.00	18.00
163	19	38	36	22.50	30.00	30.50	19.00
175	20	40	38	23.00	32.00	32.00	20.50
188	21	42	40	24.50	34.00	33.50	21.50
200	22	44	42	25.00	36.00	35.00	23.00
213	....	....	43½	26.50	38.00	36.50	24.00
225	22½	45	45½	27.00	40.90	38.00	25.50
238	....	....	47	28.50	42.00	39.50	26.50
250	23	46	49	29.00	44.00	41.00	28.00
263	....	....	50½	30.00	46.00	42.50	29.00
275	23½	47	52½	31.00	48.00	44.00	30.50
288	....	....	54	32.50	50.00	45.50	31.50
300	24	48	56	33.00	52.00	47.00	33.00
313	....	....	56½	34.50	54.00	48.50	34.00
325	24½	49	58½	35.00	56.00	50.00	35.50
338	....	....	61	36.50	58.00	51.50	36.50
350	25	50	63	37.00	60.00	53.00	38.00

"When rates are not shown in the above table for the exact distance, the rates given for the next greater distance should be used.

"In fixing rates the distance is to be computed from the point where the freight is received in this State, notwithstanding it may pass from one road to another.

LIMITATION OF CHARGES ON FREIGHT.

"The Commissioners are authorized and empowered by the act to reduce the rates on any of said railroads, or parts of railroads, for freights in either of the general or special classes, and any individual, company or corporation, owning, operating, managing or leasing any railroad, or part of railroad, in this State is, according to the terms of said act, bound by the decision of the Commissioners, with reference to the rates so fixed by the Commissioners, and the Commissioners, in pursuance of the authority vested in them, decide and so declare that, until further notice is given, the rates on the articles now placed in, and belonging to the four general classes, shall not be a greater or higher rate than was charged in the established rates in force on said roads, respectively, on the 1st day of January, 1878 And no individual, company or corporation, owning, operating, managing or leasing any railroad in this State, is entitled to charge, or receive, a greater or higher rate for carrying articles belonging to either of the special classes herein named, than is specified in the above table."

General Railroad News.

MEETINGS AND ANNOUNCEMENTS.

Meetings.

Meetings will be held as follows:

Raleigh & Gaston, annual meeting, at the office in Raleigh, N. C., July 18, at 10 a. m.

Atlanta & West Point, annual convention, in Atlanta, Ga., July 27.

Dividends.

Dividends have been declared as follows:

Winchester & Potomac (leased to Baltimore & Ohio), 3 per cent., semi-annual, payable July 1.

Atlanta & West Point, 4 per cent., semi-annual.

Portland, Saco & Portsmouth (leased to Eastern), 3 per cent., semi-annual.

Naugatuck, 5 per cent., semi-annual, payable July 15.

Foreclosure Sales.

The sale of the *Annapolis & Elkridge* road, which was to take place in Baltimore, July 2, has been indefinitely postponed, the trustees having been enjoined from proceeding further.

The sale of the *Leavenworth, Lawrence & Galveston* road has been adjourned from July 10 to Aug. 9, at Topeka, Kansas.

The Narrow-Gauge Railroad Convention.

The National Central Executive Committee of the National Narrow-Gauge Railroad Convention has issued the following circular, dated at Bedford, Ind., June 25, 1878.

The National Narrow-Gauge Railroad Convention, which assembled in St. Louis, June 19, adopted the following resolution:

"*Resolved*, That in view of the necessity of concert of action, and the dissemination of information on construction and practicability of narrow-gauge railroads, a National Central Executive Committee, consisting of thirteen persons, be appointed, to whom all applications may be made for information, and all statistics bearing on the question be forwarded. Said committee to have full authority to call the 'narrow-gauge' advocates into convention at such times and places as they may think proper, and to take such action as they may deem advisable to advance the general interests of the narrow-gauge movement."

In accordance with the above, by order of the committee, a National Narrow-Gauge Convention is hereby called to meet in Cincinnati, July 17, 1878.

Six years having elapsed since the meeting of the first National Narrow-Gauge Convention and the call for the present one, during which period several hundred miles of narrow-gauge road have been built annually, and put in operation, it will offer an opportunity for narrow-gauge contractors and managers, locomotive-builders, car-builders, manufacturers of railway supplies, and rail-makers:

1st. To *practically* compare the cost af the two systems, standard and narrow-gauge.

2d. To *practically* compare the power and speed of locomotives.

3d. To *practically* compare the capacity, comfort and safety of passenger rolling stock.

4th. To *practically* compare the capacity of freight rolling stock.

5th. To *practically* compare the question of dead weight.

6th. To *practically* compare the operating expenses of the two gauges.

7th. To *practically* ascertain how far narrow-gauge savings in first cost, interest account, dead weight, wear and tear, repairs, material for repairs, and taxes, affect passenger and freight rates.

8th. To *practically* compare the narrow-gauge with the standard gauge, *as the means of development*.

9th. To *practically* demonstrate that from the comparatively small cost of the narrow-gauge, that it is within the means of numerous localities to provide themselves with railroad facilities, by the adoption of the new *cheap system*, where otherwise they must necessarily remain without them for many years.

10th. To *practically* demonstrate to the full satisfaction of capital, that narrow-gauge roads, in favorable localities, economically constructed and operated, are good safe investments.

These questions are of grave importance to the present and future interests of the people of the United States, and can all be answered in favor of the new system, provided delegates to the convention come prepared to make full reports of the cost of their respective roads, as well as reports of operating expenses.

All narrow-gauge roads completed, partially constructed, or projected; narrow-gauge construction companies and contractors; all locomotive builders, car works, manufacturers of railway supplies, rail mills and railway journals, are cordially invited and urgently requested to send delegates.

The convention will be an important one, and should be largely attended by the parties in interest.

As delegates are appointed, they are requested to report the same by letter to MAJ. JOHN BYRNE,
Secretary Local Committee, Burnet House, Cincinnati.

By order of the National Central Executive Committee.

E. HULBERT,
Secretary, Bedford, Ind.

ELECTIONS AND APPOINTMENTS.

Alabama Great Southern.—The following are officers of this road (formerly the Alabama & Chattanooga), some of these appointments having been previously announced: Fred. Wolffe, Financial Manager; W. H. Mims, Treasurer; L. B. Morrison, General Freight and Ticket Agent; R. A. Bacon, General Agent. Offices at Chattanooga, Tenn.

Atlantic & Audubon.—The officers of this new company are: President, A. Kimball, Davenport, Ia.; Secretary, J. L. Drew, Davenport, Ia.; Treasurer, H. F. Royce. Messrs. Kimball and Royce are officers of the Chicago, Rock Island & Pacific.

Boston & New York Air Line.—Mr. J. E. Foster having resigned the office of General Passenger Agent, all communications relating to this department should be addressed to H. A. Kimball, General Ticket Agent. Car service reports should be made to Mr. Kimball, and remittances made to F. A. Johnson, Cashier. Offices at New Haven, Conn.

Burlington & Lamoille.—Mr. E. Sprague, late General Freight and Passenger Agent, being no longer connected with this road, car service and ticket reports should be addressed to D. C. Linsley, General Manager. Remittances should be made to and drafts drawn on C. H. Clark, Cashier. Offices at Burlington, Vt.

Cairo & Vincennes.—Mr. A. Van Tuyl is appointed Master Mechanic, in place of Mr. C. H. Cory, resigned to accept the same position on the Central Railroad of Iowa.

Central, of Iowa.—Mr. C. H. Cory has been appointed Master Mechanic. He has been for several years on the Cairo & Vincennes road.

Central, of New Jersey.—The board has elected Francis S. Lathrop a director, in place of John Taylor Johnston, resigned. Mr. Lathrop is now Receiver, and will, it is reported, be chosen President of the company when the reorganization is completed.

Central Pacific.—Mr. E. W. Hopkins has been elected Treasurer, in place of Mark Hopkins, deceased. Office in San Francisco, Cal.

Chesapeake & Ohio.—The following circular from Gen. Williams C. Wickham, late Receiver and now Second Vice-President of the new company, is dated July 1:

"1st. Under appointment by the Chesapeake & Ohio Railway Company as Second Vice-President, and under general instructions from C. P. Huntington, President, I assume control of the operations of the company in Virginia and West Virginia.

"2d. The following organization of the operating departments has been made, and is announced for the information of employés, viz.: W. M. S. Dunn, Engineer and Superintendent of Transportation; Gen. I. M. St. John, Consulting Engineer; J. Garrett, Cashier; B. B. Weisiger, General Bookkeeper; B. S. Fitch, General Freight Agent; Conway R. Howard, General Ticket Agent; James F. Netherland, Auditor of Revenue; W. H. Lowry, Auditor of Disbursements; James H. Patteson, Paymaster.

"3d. Arrangements between connecting lines and the Chesapeake & Ohio Railroad Company existing June 30, 1878, will continue in force under the new organization.

"4th. The rules prescribed in the Chesapeake & Ohio Railroad Book of Rules and Regulations, as modified from time to time, will continue to be enforced and obeyed.

"5th. I confidently expect the same cordial support from officers and employés that they have heretofore rendered me."

Chicago & Lake Huron.—Mr. Fred. L. Clark having resigned the position of Division Superintendent of the Chicago & Lake Huron Railroad, that office has been suspended, and Mr. Henry Funnell has been appointed Superintendent, to have charge of the entire line, with headquarters at Battle Creek, Mich.

Chicago & Springfield.—At the annual meeting in Chicago, July 2, Stuyvesant Fish and J. C. Welling were chosen directors for three years. The road (formerly the Gilman, Clinton & Springfield) is leased to the Illinois Central.

Colorado Central.—Col. C. W. Fisher is appointed Superintendent, with office at Cheyenne, Wyoming. He is also Superintendent of the Mountain Division of the Union Pacific.

Florida Central.—Mr. Aaron Marvin has been elected Secretary and Treasurer, and will also have charge of the Auditing Department. The office of General Superintendent having been discontinued, James S. McElroy, Master of Machinery, will act as Master of Transportation also, and all business communications for the General Superintendent's office should be addressed to W. M. Davidson, General Freight and Ticket Agent, at Jacksonville, Fla.

Georgia.—Mr. E. R. Dorsey has been appointed General Freight and Ticket Agent. He was recently Assistant General Freight Agent of the Baltimore & Ohio.

Grinnell & Montezuma.—The officers are: President, M. Snyder; Vice-President, E. Clark; Cashier and Treasurer, H. Lawrence. Offices at Grinnell, Ia.

Hannibal & St. Joseph.—Mr. T. G. Gorman has been appointed Superintendent of Motive Power, in place of G. B. Simonds, resigned. Mr. Gorman was formerly on the Wabash and on the Missouri, Kansas & Texas road.

Illinois Central.—The board has reëlected W. K. Ackerman, President; J. C. Clark, Vice-President; L. A. Catlin, Secretary; L. V. F. Randolph, Treasurer.

Indianapolis, Bloomington & Western.—The directors of the new company organized by the bondholders are: John C. Short, Danville, Ill.; Richard P. Morgan, Jr., Bloomington, Ill.; James Kirkham, Springfield, Mass.; Solomon Mead, Frank Shepard, Greenwich, Conn.; Levi H. Alden. John B. Pudney, Passaic, N. J.; Augustus Jillson, Poughkeepsie, N. Y.; Wm. J. Elger, Brooklyn, N. Y.; Wm. W. Heaton, John W. Kirk, Josiah C. Reiff, Thomas Ritch, New York.

Judges of Railroad Material at the Paris Exhibition.—The following are announced as the jury for Class 64, Group VI., of the Exhibition: England and its Colonies, Capt. Douglas Galton, R. E., C. B., F. R. S.; United States, Theodore Bronson; Sweden and Norway, A. Almgren, Chief Engineer of the Traffic Service, State Railroads; Austria-Hungary, Charles Hornbostel, Manager of the Empress Elizabeth Railroad, Vienna, and Albert von Szent-Gyorgyi, Chief Engineer of the State Railroad Company, Buda-Pesth; Belgium, M. Belpaire, Manager of the State Railroads, member of the Belgian Commission; France, M. Couche, Inspector-General of Mines (author of the most extensive French treatise on railroads and perhaps the most complete and magnificent work of the kind in any language); M. Delaistre, Manager of the Western Railroad Company; M. Solacroup, Manager of the Orleans Railroad Company; M. Mantion, Chief Engineer of Construction and Maintenance of the Northern Railroad Company and Professor in the Central School of Arts and Manufactures; M. Jacqmin, Manager of the Eastern Railroad Company, and author of a standard work on the working of railroads, a translation of a portion of which has been published in the *Railroad Gazette;* M. Marié, Chief Engineer of Equipment and Motive Power on the Paris, Lyons & Mediterranean Railroad. Three of the above, MM. Delaistre, Solacroup and Jacqmin, have the rank of chief engineer in the government corps of bridges and highways. The following are substitutes appointed by France: M. Banderali, Engineer, Inspector of the Central Service of the Equipment and Motive Power of the Northern Railroad, and M. Achille Ollivier, Civil Engineer. *Telegraph Material and Processes.*—The following form the jury for this class, No. 65 of Group VI., England, Major Webber, Chief of Military Telegraphy, Post-Office Department. Member of the Council of the Society of Telegraph Engineers; France, M. Bergon, Division Manager of the Telegraph Lines; M. Edmond Becquerel, Member of the Institute, Professor in the Conservatory of Arts and Trades. Alternates, M. Baron, Telegraph Inspector; M. Hocq, Captain of Artillery, Manager of the Transportation of Material for Military Telegraphy.

In class 66 of this group, including "Material and Processes of Civil Engineering, Public Works and Architecture," Mr. T. E. Sickels, Chief Engineer of the Union Pacific Railroad, is the only member of the jury from this country; Great Britain has two members—Professor Fleeming Jenkins and T. C. Koefer, C. E.; there is one each from Austria, Hungary, Switzerland, Belgium, Holland, Italy, and Spain, and eight members and four substitutes from France. In the jury on "Machine Tools," B. B. Hotchkiss and Charles R. Goodwin are credited to the United States, and Wm. Richardson to Great Britain.

Kansas City, Eureka and Santa Fe.—The first Board of directors is as follows: Job Throckmorton, C. H. Beacker, O. Kent, E. B. Arnold, of Kansas; Wm. Sturgess, F. L. Simons, N. F. Merrill, Wm. J. Campbell, J. F. Dane, P. B. Johnson, L. A. Pierce, C. B. Carpenter, David L. Hough, Chicago.

Kansas Pacific.—Mr. John B. Daily, late of the Kaw Valley Division, is appointed Master Mechanic of the Smoky Hill Division, in place of John Houston, resigned.

Keokuk & Des Moines.—Mr. Hugh Roberts has been appointed Car Accountant, in place of J. L. Obertop, resigned. Office at Keokuk, Ia.

Lafayette, Muncie & Bloomington.—Mr. L. Tracy has been appointed Acting General Freight Agent, with office at Lafayette, Ind.

Metropolitan Elevated.—At the annual meeting in New York, July 8, the following directors were chosen: W. R. Garrison, John Baird, Wm. Foster, Jr., George M. Pullman, Horace Porter, Jose F. Navarro, George J. Forrest, Wm. Adams, Jr., John P. Kennedy, Panisto Mora, Charles H. Clayton. The original projector of the road, Dr. R. H. Gilbert, is dropped from the board. The board elected Wm. R. Garrison, President; John Baird, First Vice-President; Wm. Foster, Jr., Second Vice-President; John E. Body, Treasurer.

New York Loan & Improvement Co.—At the annual meeting in New York, July 9, the following directors were chosen: Henry M. Alexandre, John Baird, A. M. Billings, Cornelius K. Garrison, Wm. R. Garrison, Jose F. Navarro,

Horace Porter, George M. Pullman, George F. Stone. The company built and controls the Metropolitan Elevated road.

The board reëlected George M. Pullman, President; Jose F. Navarro, Vice-President; Horace Porter, John Baird, Wm. R. Garrison, Executive Committee.

Pensacola.—Mr. R. G. Nicholls has been appointed Master Mechanic, in place of P. J. Cochran. Office at Pensacola, Fla.

Philadelphia & Reading.—Mr. Alexander M. Wilson has been appointed Superintendent of the Reading & Columbia Division, in place of B. Van Lew, deceased.

Philadelphia, Reading & Pottsville Telegraph Co.—At the annual meeting in Reading, Pa., July 3, the following officers were reëlected: President, Franklin B. Gowen; Directors, H. Pratt McKean, A. E. Borie, J. B. Lippincott, John Ashhurst; Treasurer, John Welch; Secretary, Howard Hancock. The company owns the telegraph lines along the Reading road.

Springville & Sardinia.—Mr. M. Shuttleworth has been appointed Superintendent of Construction. The company's office is at Springville, Erie County, N. Y.

Spuyten Duyvel & Port Morris.—At the annual meeting in New York, July 9, the following directors were chosen: Samuel F. Barger, A. B. Baylis, Chauncey M. Depew, John B. Dutcher, Joseph Harker, Wm. H. Leonard, Robert J. Niven, Augustus Schell, Wm. H. Vanderbilt, Cornelius Vanderbilt, Wm. K. Vanderbilt, Frederick W. Vanderbilt, Wm. C. Wetmore. The road is owned by the New York Central & Hudson River.

Toledo & Southwestern.—At the annual meeting in Toledo, O., June 21, the following directors were chosen: T. M. Cook, C. H. Coy, D. W. H. Howard, O. E. M. Howard, S. S. Laskey, J. J. Voorhees, W. P. Young. The board elected the following officers: President, D. W. H. Howard, Moscow, O.; Vice-President, W. P. Young, Edwardsville, O.; Secretary, J. J. Voorhees, Grand Rapids, O.; Treasurer, George Laskey, Ottawa, O.

Union Pacific.—Mr. P. P. Shelby has been appointed Assistant General Freight Agent. Mr. Charles B. Havens succeeds Mr. Shelby as Superintendent of the Omaha Bridge and Transfer.

Col. C. W. Fisher is appointed Superintendent of the Mountain Division. He was recently Superintendent of the Denver Division of the Kansas Pacific.

PERSONAL.

—Hon. Giles W. Hotchkiss, for several years a director of the Erie Railway Company, died at his residence in Binghamton, N. Y., July 5, aged 63 years. He was an active and prosperous lawyer, and was well known and influential through the "Southern Tier" of New York. He represented his district in Congress for eight years.

—English newspapers of June 22 say that Mr. George M. Pullman had arrived there for a short stay before going to Paris, and that a committee was being formed to entertain him at a public dinner.

—Mr. G. B. Simonds has resigned his position as Superintendent of Motive Power of the Hannibal & St. Joseph road. The employés of the department entertained Mr. Simonds handsomely at Brookfield, Mo., on his leaving the road, and presented him with a gold-mounted cane and a draft for $500, gold. Mr. Simonds had been two years on the road, having previously held a similar position on the Missouri Pacific and other large roads.

—Mr. F. N. Finney, before leaving the Toledo, Peoria & Warsaw road for his new position as General Manager of the Wisconsin Central, was visited by a delegation of the employés of his old road, and presented with a valuable collection of books, costing nearly $300, accompanied by an address setting forth their high esteem for him.

—Mr. Francis M. Johnson, of Newton, for some years a member of the Massachusetts Railroad Commission, died at his home at Newton Centre, July 6. He was born in Kingston, Mass., and began life as an iron-founder, but went to Boston nearly 30 years ago and entered the leather bnsiness, in which he accumulated a considerable fortune. He was appointed Railroad Commissioner by Governor Washburn six years ago, reappointed in 1875 by Governor Gaston, and recently declined an appointment for a third term on account of his failing health. He had been a sufferer from asthma for years, but died rather unexpectedly at last. His services in the board were valuable on account of his experience and ability as an accountant, and he was highly esteemed by his associates.

TRAFFIC AND EARNINGS.

Water Rates.

The Buffalo *Commercial Advertiser* says: "Discouraging as the transportation business was for the month of May, it was even worse for June, as will be seen from the following comparative exhibit, showing the average rates from Chicago to Buffalo by lake, for the month of June, on wheat and corn, and also the average from Buffalo to New York by canal, on the same cereals, for the seasons named:

	—Lake.—		—Canal.—	
Year.	Wheat. Cts.	Corn. Cts.	Wheat. Cts.	Corn. Cts.
1869	6.6	6.5	13.7	11.7
1870	6.2	5.5	10.8	9.6
1871	5.7	5.3	10.1	9.1
1872	8.3	7.8	12.1	11.0
1873	6.5	5.8	10.6	9.6
1874	4.2	3.9	11.3	10.3
1875	3.0	2.6	6.9	6.3
1876	2.5	2.3	6.2	5.4
1877	2.4	1.9	5.0	4.3
1878	2.1	1.8	4.7	4.1

"The average rate for the past month was nearly half a cent lower than that for May, which indicated a starvation business for carriers. From the above it will be seen that the entire expense of moving a bushel of wheat from Chicago to New York, by Lake and canal, was 6.8 cents, or 7.3 cents including terminal charges at Buffalo. This is cheap transportation with a vengeance! But so long as the railways pursue the policy they have followed this season, there is nothing left for vessel men to do but to meet the rail rates. It is probable, however, that the addition of the Michigan Central to the Vanderbilt system will result in a change of policy on the part of the railways. The rate on grain has already been advanced to 16 cents a hundred—or 9.6 cents a bushel—and it is probable that another rise will be announced as soon as the new crop begins to move."

Chicago Charges for Switching to Elevators.

Heretofore the railroads carrying from Chicago to the East have made a charge of $2 for every car sent to an elevator to be loaded, which has worked in favor of shipping grain through from stations on the Western railroads, without selling or transferring at Chicago. Last week this charge was abolished, and at the same time the elevators abolished the charge of $1 for "trimming" a car loaded with grain. The abolition of the charge for cars is equivalent to a reduction of 1 cent per 100 lbs. in the rate from Chicago. The old charge, however, was in addition to the quoted rate, and applied only to cars loaded at elevators, and not to those received loaded from connecting roads.

Railroad Earnings.

Earnings for various periods are reported as follows:

	1877-78.	1876-77.	Inc. or Dec.	P. c.
Year ending Feb. 28:				
Vicksburg & Merid'n	$430,429	$411,685 I.	$18,744	4.6
Expenses	307,064	305,855 I.	1,209	0.4
Net earnings	$123,365	$105,830 I.	$17,535	16.6
Earnings per mile	3,031	2,899 I.	132	4.6
P. c. of expenses	71.34	74.29 D.	2.95	4.0
Six Months ending June 30:	1878.	1877.		
Atchison, Topeka & Santa Fe	$1,498,382	$1,036,671 I.	$461,711	44.5
Bur., Cedar Rapids & Northern	793,531	428,649 I.	364,882	85.1
Central Pacific	7,883,353	7,838,705 I.	44,658	0.6
Chi. & Alton	1,993,941	2,031,742 D.	37,801	1.9
Chi., Mil. & St. Paul	4,257,000	2,958,152 I.	1,298,848	43.9
Grand Trunk	4,350,177	4,326,907 I.	23,270	0.5
Gt. Western, of Can.	2,201,600	1,994,832 I.	206,768	10.4
Ill. Cen., Ill. lines	2,451,671	2,174,750 I.	276,921	12.7
" Spring. Div.	88,371	.....	.....	....
" Iowa lines	748,766	599,373 I.	149,393	24 9
Kansas Pacific	1,435,975	1,346,045 I	89,930	6.7
Missouri, Kansas & Texas	1,255,760	1,430,933 D.	175,173	12.2
St. L., Alton & T. H. Belleville Line	223,263	238,491 D.	15,228	6.4
St. Louis, Iron Mt. & Southern	1,868,068	1,932,141 D.	64,073	3.3
St. Louis, Kan. City & Northern	1,510,096	1,411,222 I.	98,874	7.0
St. Louis & Southeastern	528,868	487,080 I.	41,788	8.6
Toledo, Peoria & Warsaw	613,042	498,503 I.	114,539	23.0
Wabash	2,216,681	2,059,070 I.	157,611	7.7
Five Months ending May 31:				
Atlantic, Miss. & Ohio	$641,716	$628,109 I.	$13,607	2.2
Gal., Harrisburg & San Antonio	443,975	370,331 I.	73,644	19.9
St. Louis & Southeastern	442,341	408,262 I.	34,079	8.3
Net earnings	88,741	67,117 I.	21,624	32.2
P. c. of expenses	80.00	83.61 D.	3.61	4.3
Southern Minnesota	320,359	172,072 I.	148,287	86.2
Four Months ending April 30:				
Grand Trunk	£608,340	£582,766 I.	£25,574	4.4
Net earnings	130,689	110,199 I.	20,490	18.6
P. c. of expenses	78.56	81.06 D.	2.50	3.1
Month of May:				
Atlantic, Miss. & Ohio	$125,208	$123,614 I.	$1,594	1.3
Gal., Harrisburg & San Antonio	88,254	66,478 I.	21,776	32.7
Southern Minnesota	81,769	36,289 I.	45,480	125.3
Month of June:				
Atchison, Topeka & Santa Fe	$251,000	$185,731 I.	$65,269	35.1
Bur., Ced. R. & Nor.	101,014	69,357 I.	31,657	45.6
Central Pacific	1,460,000	1,484,232 D.	24,232	1.6
Chicago & Alton	349,502	358,982 D.	9,480	2.6
Chi., Mil. & St. Paul	636,000	588,223 I.	47,777	8.0
Ill. Cen., Ill. lines	406,939	386,905 I.	20,034	5.4
" Spring. Div	14,151	.....	.....	....
" Iowa lines	115,020	95,257 I.	19,763	20.7
Kansas Pacific	223,523	253,652 D.	30,129	11.9
Missouri, Kansas & Texas	207,514	258,123 D.	50,609	19.6
Rochester & State Line	50,057	.....	.....	....
Net earnings	24,057	.....	.....	....
P. c. of expenses	52.00	.....	.....	....
St. L. Alton & T. H. Belleville Line	38,548	35,079 I.	3,469	9.9
St. L., I. Mt. & Sout'n	253,600	274,164 D.	20,564	7.5
St. Louis, Kan. City & Northern	205,733	171,856 I.	33,877	19.7
St. Louis & Southeastern	86,527	78,818 I.	7,709	9.8
Tol., Peoria & War.	76,887	80,010 D.	3,123	3.9
Wabash	322,801	353,847 D.	31,046	8.8
Week ending June 28:				
Gt. West., of Can	$79,050	$73,178 I.	$5,873	8.0
Week ending June 29:				
Grand Trunk	$165,794	$181,461 D.	$15,667	8.6

Grain Movement.

For the six months from Jan. 1 to June 29 receipts and shipments of flour and grain are reported as follows by the New York Produce Exchange, flour in barrels and grain in bushels:

	1878.	1877.	Increase.	P. c.
Flour:				
Northwestern receipts	2,832,815	1,980,176	852,639	43.1
" shipments	2,857,404	1,997,953	859,451	43.0
Atlantic receipts	4,096,079	3,534,255	861,824	26.6
Wheat:				
Northwestern receipts	28,965,777	7,998,297	20,967,480	262.1
" shipments	21,285,983	8,538,059	12,747,924	149.3
Atlantic receipts	34,613,424	4,846,498	29,766,926	614.1
Corn:				
Northwestern receipts	44,904,384	34,804,507	10,099,877	29.0
" shipments	38,089,555	27,500,402	10,589,153	38.5
Atlantic receipts	59,051,686	40,550,064	18,501,622	45.6
All Grains:				
Northwestern receipts	90,850,771	55,582,592	35,268,179	63.5
" shipments	70,224,959	45,590,024	24,634,335	54.0
Atlantic receipts	107,930,455	56,004,345	51,926,110	92.7

These enormous increases are over a poor year, it is true, but the business this year will stand a comparison with that of any former year, as will be seen below, where the number of bushels of grain of all kinds is compared for five years:

Northwestern Receipts:				
1878.	1877.	1876.	1875.	1874.
90,850,777	55,582,592	75,365,818	58,076,971	85,278,787
Northwestern Shipments:				
1878.	1877.	1876.	1875.	1874.
70,224,959	45,590,024	66,325,316	43,948,745	62,488,937
Atlantic Receipts:				
1878.	1877.	1876.	1875.	1874.
107,930,455	56,004,345	77,834,922	52,380,434	67,027,697

Thus in every particular the movement has been larger this year than ever before; for the movement of the crops of 1873-74 had never been approached before. This year we have 6.6 per cent. larger receipts and 6 per cent. larger shipments at Northwestern markets and nearly 40 per cent. larger Atlantic receipts than in the years of heaviest movement heretofore.

For the week ending June 29 receipts of grain of all kinds at the eight leading Northwestern markets were:

1878.	1877.	1876.	1875.	1874.
3,851,821	2,029,971	3,863,510	2,637,590	4,437,625

The shipments of the above markets for the same week were:

1878.	1877.	1876.	1875.	1874.
2,624,876	2,627,653	3,605,703	3,350,600	3,307,404

The shipments are thus *smaller* this year than in any of the other four.

The portion of the above shipments that went by rail and its percentage of the total were:

1878.	1877.	1876.	1875.	1874.
824,773	781,921	1,784,518	1,036,799	702,198
31.4	29.8	49.5	30.9	21.2

For the crop year ending June 30, 1878, the exports from San Francisco were 442,000 barrels of flour and 6,335,982 bushels of wheat, equivalent, reducing flour to wheat, to 8,545,982 bushels of wheat. These were the largest exports for several years. All, or nearly all, the wheat went to England; the flour was distributed between England, China, South America and the Pacific Islands.

The receipts at Atlantic ports for the same week have been:

1878.	1877.	1876.	1875.	1874.
3,788,798	2,431,213	4,481,981	2,645,876	3,965,793

The general movement for the week may be characterized as light. Though rail rates were so low that a recent agreement to make them 16 cents per 100 lbs. from Chicago to New York is characterized as an "advance," it appears that little of the grain went to the railroads—not half as much as in 1876, when the total shipments were almost the same.

Petroleum Exports.

For the six months from Jan. 1 to June 29 the exports of petroleum from the several ports have been as follows for four years:

	1878.	1877.	1876.	1875.
New York	82,880,499	102,911,855	53,476,487	64,115,528
Boston	1,280,504	1,796,354	1,090,313	1,220,639
Philadelphia	16,842,410	20,215,650	28,682,140	19,916,781
Baltimore	14,205,976	15,003,967	18,140,244	13,255,679
Richmond	.....	2,687,600	.....	.....
Portland	1,001	1,389,804	.....	.....
Norfolk	.....	890,100	.....	.....
Total	115,210,390	144,395,330	101,389,183	98,508,424

Though the total exports were 20 per cent. less than last year, they were larger than in any preceding year, the largest before 1877 being 109,588,285 gallons, in 1874.

The percentage of the total exports shipped from each of the leading ports for the four years have been:

	1878.	1877.	1876.	1875.
New York	72.0	71.3	52.7	65.9
Philadelphia	14.6	14.0	28.3	20.2
Baltimore	12.3	10.4	17.9	13.5
Other ports	1.1	4.3	1.1	0.4

There is thus not much change from last year, except in an addition to Baltimore's receipts taken chiefly from Richmond, New York and Portland. Prices are about as low as ever were known, but this does not seem to stimulate exports which were much larger last year at much higher prices.

Coal Movement.

Coal tonnages are reported as follows for the six months ending June 29, the tonnage given in each case being only that originating on the line to which it is credited:

Anthracite:	1878.	1877.	Inc. or Dec.	P. c.
Philadelphia & Reading	2,089,742	2,873,528 D.	783,786	27.3
Northern Central, Shamokin Div., and Summit Br. R. R.	298,278	302,669 D.	4,391	1.4
Danville, Hazleton & Wilkesbarre	12,005	6,672 I.	5,333	8.0
Pennsylvania Canal	114,382	167,180 D.	52,798	31.6
Central of N.J., Le'h Div.	956,045	1,513,728 D.	557,683	36.8
Lehigh Valley	1,420,768	1,939,438 D.	518,670	26.7
Penn. & New York	13,066	27,374 D.	14,308	52.2
Del., Lacka. & Western	888,185	1,106,518 D.	218,333	19.7
Del. & Hudson Canal Co.	899,942	1,101,729 D.	201,789	18.3
Pennsylvania Coal Co	350,737	527,160 D.	176,423	33.5
State Line & Sullivan	15,588	5,119 I.	10,469	205.3
Total anthracite	7,058,738	9,571.115 D.	2,512,377	26.0
Semi-bituminous:				
Cumberland, all lines	611,589	677,464 D.	65,875	9.7
Huntingdon & Br'd Top	68,316	67,950 I.	366	0.5
East Broad Top	30,784	25,427 I.	5,357	21.1
Tyrone & Clearfield	599,488	655,887 D.	56,399	8.6
Bellefonte & Snow Shoe	12,824	21,819 D.	8,995	41.3
Total semi-bitu's	1,323,001	1,448,547 D.	125,546	8.7
Bituminous:				
Barclay	148,951	160,409 D.	11,458	7.1
Allegh'y Region Pa. R.R.	94,795	100,341 D.	5,546	5.5
Penn and Westmoreland gas coal	337,332	370,220 D.	32,888	0.9
West Pennsylvania R. R.	93,436	94,063 D.	627	0.7
Southwest Penn. R. R.	12,558	20,672 D.	8,114	39.2
Pitts'rgh Region, Pa. R.R.	206,274	184,514 I.	21,760	11.8
Total bituminous	893,346	930,219 D.	36,873	4.0
Coke:				
Penn and Westmoreland.	32,393	.....	.....	.....
West Pennsylvania R. R.	38,740	.....	.....	.....
Southwest Penn. R. R.	367,613	.....	.....	.....
Pitts'rgh Region, Pa. R.R.	43,611	.....	.....	.....
Total coke	482,357	398,275 I.	84,082	21 1

The circular prices of anthracite are a little higher, but it is said that many large lots are sold considerably below the regular prices.

The anthracite tonnage of the Belvidere Division, Pennsylvania Railroad, for the six months was:

	1878.	1877.	Inc. or Dec.	P.c.
Coal Port for shipment	1,320	10,937 D.	9,617	88.2
South Amboy for shipment	236,398	317,371 D.	80,973	25.5
Local distribution on N. J. lines	79,540	85,652 D.	6,112	7.1
Company's use on N. J. lines	39,324	37,390 I.	1,934	5.2
Total	356,582	451,350 D.	94,768	21.0

Of the total this year 266,083 tons were from the Lehigh and 90,499 tons from the Wyoming Region.

East-Bound Freight Rates.

At a meeting of General Freight Agents in Chicago, July 3, the following freight rates were agreed upon, to take effect at once:

Chicago to	Fourth class and provisions, per 100 lbs.	Grain, per 100 lbs.	Flour, per barrel.
New York	18 cts.	16 cts.	32 cts.
Baltimore	16 "	14 "	28 "
Philadelphia	16 "	14 "	28 "
Boston	23 "	21 "	42 "

The last tariff adopted was on May 17, when the rates to New York were made 25 cents for fourth-class and 20 cents for grain. These, however, have not been strictly adhered to, and rates have been reported as low as 15 cents for fourth-class.

Colorado Rates.

The effect of the combination of the Union Pacific and the Kansas Pacific has been the advance of the passenger rate between Denver and Cheyenne from $5 to $7, and freight which during the heat of the conflict was taken for $50 per car-load from Chicago to Denver, is now charged $300.

RAILROAD LAW.

Railroads and Highways in Connecticut.

A law passed by the late Legislature of Connecticut provides that no new highway shall be opened parallel to a railroad track and within less than 100 yards of the same, unless the lay-out shall first have been submitted to a judge of the Superior Court and by him declared to be necessary to the public convenience, after due hearing of all parties concerned. If the judge shall authorize the laying out of the highway,

he shall require the town to build and maintain between the road and the railroad such a fence as, in his opinion, the public safety may require.

Another law passed is as follows:

"Any person traveling upon any public street or highway which is crossed by a railroad, who shall be obstructed or prevented from crossing such railroad for a longer time than five minutes, by reason of trains, cars or locomotives standing upon or across such street or highway, may recover not exceeding $50 from the corporation owning or operating said railroad; provided suit is brought within 30 days after the date of such obstruction."

Illinois Tax Cases.

In the case of the Indianapolis & St. Louis Company the United States Supreme Court has decided that the taxes for 1873, 1874 and 1875, levied against this company as lessee of the St. Louis, Alton & Terre Haute, were assessed in accordance with the State law, and has affirmed the decree of the Circuit Court in the case.

Common Carrier's Liability.

In Morton and others against the Pittsburgh, Cincinnati & St. Louis Co., the Indiana Supreme Court lately held:

1. A common carrier may so hold himself out to the public as to make himself liable for not receiving and carrying goods beyond his own line; or by a special contract he may make himself liable for not receiving and carrying goods beyond his own line; or if a person not a common carrier in fact, and not holding himself out to the public as such, undertakes by contract to carry goods to a given point, he will be held liable for a breach of his contract as a common carrier.

2. To entitle a party to an affirmance of a judgment in this court there must be evidence in the record fairly tending to support all the facts necessary to the verdict found in the court below.

3. A common carrier is not found to depart from his ordinary and usual mode of business in receiving goods to carry.

4. The common law rule that a common carrier is responsible for all losses not occasioned by the acts of providence or the State's enemies does not include losses which arise from the ordinary wear and tear of goods in the course of transportation, nor from their ordinary loss or destruction in quantity or quality, nor from their inherent or natural infirmity and tendency to damage. In such case the carrier is not responsible on his implied obligation unless the injury was caused by his fault. (Story bail., sec. 492.) For instance, where goods in a car are damaged by such car becoming heated through the fault of the carrier.

THE SCRAP HEAP.

Railroad Manufactures.

Besides other contracts reported, the Baldwin Locomotive Works in Philadelphia have orders from the Northeastern of Georgia, Morgan's Louisiana & Texas, a Wisconsin narrow-gauge road, and for a shifting engine from the Bethlehem Iron Co.

The Barney & Smith Manufacturing Co., at Dayton, O., has recently taken contracts for 100 box cars for the Chicago, Rock Island & Pacific; one baggage, mail and express car for the Cairo & Vincennes; 10 box cars for the Corpus Christi, San Diego & Rio Grande; 14 passenger coaches, 300 box and 200 33-ft. gondola cars for the Pittsburgh & Lake Erie; two 30-ft. cabooses for the Central Branch, Union Pacific, and one for the Fort Dodge & Fort Ridgeley.

The Rogers Locomotive Works, at Paterson, N. J., have an order for several engines for the St. Paul & Pacific, and also one for three engines to go abroad.

The Danforth Locomotive Works, at Paterson, N. J., are building a very large roof for some government buildings.

The Grant Locomotive Works, at Paterson, N. J., have an order for 10 more engines for the Metropolitan Elevated Railroad in New York.

The Roane Iron Co., at Chattanooga, Tenn., has the contract for the rails for an extension of the Duck River Valley road.

The Mingo Iron Works, at Steubenville, O., have made an assignment for the benefit of their creditors.

The Steubenville (O.) Furnace & Iron Co. has shut down, on account of depression in the iron trade.

The Garry Iron Roofing Co., at Cleveland, O., is making the roofs for the shops of the Indianapolis, Peru & Chicago road, at Peru, Ind.

The blast furnace of the bankrupt Rochester Iron Manufacturing Co., at Charlotte, N. Y., was sold at sheriff's sale June 20, and bought in for $7,257 by Henry C. Roberts & Co., who held a judgment for about that amount.

The car shops of Gilbert, Bush & Co., at Green Island, N. Y., are full of work.

The Ohio Falls Iron Co., at New Albany, Ind., has just completed and put in use a new double muck train of rolls.

The Albany & Rensselaer Steel & Iron Co. has all its departments fully at work except the nail and spike mill. The forge at Troy recently finished a steel propeller shaft 22 ft. 9 in. long, and 6⅛ in. diameter. It weighed 2,347 lbs., and was forged from an ingot 15 in. square.

The Cuyahoga Steam Furnace Co., at Cleveland, O., is making a 4,000-lb. steam helve-hammer for the Albany & Bensselaer Steel & Iron Works.

The rail mill of the Pennsylvania Steel Co., at Baldwin, Pa., shut down for a few days on July 3, to make some necessary repairs.

The assignees give notice that the tools, machinery and stock of the J. C. Hoadley Company will be sold at auction at the works in Lawrence, Mass., July 24, beginning at 10 a. m. The sale will include a large number of machine tools of all sorts, some finished engines, parts of engines, boilers, castings, boiler iron and other stock on hand, and a large number of patterns.

Bridge Notes.

An iron bridge of three spans over Raccoon Creek on the Pittsburgh, Cincinnati & St. Louis road, built by Clark, Reeves & Co., of Phoenixville, Pa., was tested last week, with satisfactory results.

Samuel Roberts and C. H. Register, committee, will receive at Smyrna, Del., until July 24, bids for an iron pivot bridge, with centre pier resting on screw-piling, across Duck Creek, at Flemming's Landing. The creek is 165 ft. wide, and the draw must have two openings each 40 ft. clear, the rest of the bridge to be fixed. It is to be a highway bridge, built jointly by New Castle and Kent counties.

Safety Car Runner.

A trial of an invention brought out by the American Railway Car Runner Co. was recently made on the Minneapolis & St. Louis road, and is thus described by the St. Paul *Pioneer-Press:* "The runner consists of a bar of iron 4¼ in. thick, suspended from the truck outside of and underneath the oil boxes, and secured across the ends of the truck, by the brake-beams. It is braced, between the wheels, and so constructed as to completely encircle and bind the truck. The runner hangs about four inches out from the wheels, on either side, and about one-half inch above the tread of the wheel. It is claimed for this runner that it will hold the car to the track under any and all circumstances, and yesterday's trial certainly sustained the claim.

"The scene of the trial was in a sharp curve (6 degrees). An outside rail, 30 feet in length, was removed, and the car, an empty flat, was sent over the gap at the rate of 15 miles an hour. The runner did its work beautifully; the trucks dropped on the ties, but were held close to the rail, and the car stopped in a distance of 30 feet. On the second trial the car was sent over the gap at the rate of 25 miles an hour, and ran about 150 feet, the runner holding it close to the rail, as before, and in each instance the car was replaced upon the track, uninjured, in less than 30 seconds!"

Keeping the Fourth.

The following circular was issued to all the employés of the Toledo, Peoria & Warsaw road on July 1:

"July Fourth will be observed as a general holiday. Only passenger trains and such freight trains as may be necessary to move perishable property will be run on that day. Satisfactory evidence to the conductors that you are in the employ of this railway will pass you on any trains from Wednesday, July 3, at noon, till Friday, July 5, night. Your families will be passed with you.

"Hoping you will thoroughly enjoy yourselves,

"I am yours truly,

"WILLIAM F. MERRILL, Supt."

Hauling a Balloon.

The people of Hammonton, N. J., recently resolved to round out and complete their Fourth of July celebration by a balloon ascension, and they engaged the balloon and a young woman to navigate it. One little difficulty was that no gas could be had in Hammonton, but it was finally decided to inflate the balloon in Camden and hire a special train to tow it down. The railroad people were doubtful about it, but finally consented to furnish the train, taking no risk. The balloon was all ready and was made fast to the derrick of a wrecking car; the locomotive coupled on and started. Somehow it did not go very fast; the locomotive pulled one way and the balloon another, and the speed was not at all alarming, in fact about two miles an hour or so. At last a desperate pull was made and the train got off at quite a respectable pace, but suddenly there was a stop not set down in the time-table. The balloon had caught in a tree, and in a few minutes more there was a sound of escaping gas, then a melancholy collapse, and in a little while a train backed into the Camden yard with what had been the balloon, now apparently a shapeless pile of rags, on a flat car. There was no balloon at Hammonton on the Fourth and the railroad men quietly say "I told you so."

Wouldn't Get Out of the Way.

The Shamokin, (Pa.) *Herald* of recent date says: "When the train got beyond Keefer's Station, on Monday afternoon, Tommie Umpleby saw two men walking on the track. He whistled an alarm, but they paid no attention; he felt uncomfortable, and when much nearer to them rang the bell. Merely glancing back, they stepped off but kept walking close to the track, heeding no alarms and not deigning to again look back. Conductor Boughner was watching them when the bumper struck one of them on the back, shooting him from under his hat, and causing him to sit down in a hasty manner with a look of intense astonishment upon his countenance, and then the conductor laughed, and laughed, and laughed; but the engineer was frightened; fearing, probably, that he had knocked the fool's brains out, and was right glad to see him slowly gather himself up and walk after the train."

Crossing a Broken Bridge.

The Elmira (N. Y.) *Gazette* tells the following incident, said to have occured on the Tioga Railway, last week: "It seems that the recent floods had washed out all the underpinning or substructure of a bridge on the road leaving the rails and stringers across with nothing to support them. The bridge was about 30 feet long and the channel about six feet deep. The train was an express under full headway. As the engine reached the bridge it went down, the rails bending so as to touch the ground in the center, forming a double inclined plane. The train went down one and climbed up the other, crossing the chasm in safety without hurting any one. So steep was the curve that the tops of the ends of the cars came together crushing them in, as one car would reach the bottom and the other would begin to ascend."

Tramps.

The tramps traveling through Iowa in large numbers have become such a formidable nuisance, especially on the railroads, that the Governor of the State has issued a proclamation calling upon sheriffs of counties and mayors of incorporated cities to make every effort to suppress them. He reminds the authorities that they are empowered by law to call on the organized militia for aid, and, in case of necessity, to call out and arm citizens to enforce the laws and preserve peace.

The Syracuse (N. Y.) *Standard* says: "Three tramps attempted to take possession of an engine at Auburn, yesterday forenoon. They jumped on the machine about half-past nine o'clock, when the engineer, Shapcott, and three others showed fight. After a short struggle the tramps were ejected, one of them receiving a cut over his eye."

Model of a Pullman Car at Paris.

An English paper says: "The model car sent to the Paris Exposition by the Pullman Company, of America, is 30 in. long, 8 in. wide, and is constructed entirely of gold and oxydized silver. It is furnished perfectly to the most minute detail. The rails upon which it stands are silver and the wheels gold. The platform at either end is of gold, chased with crossed lines to represent the uneven surface of the common platform. The body of the car is of oxydized silver, exquisitely chased, and the doors of the same, while the knobs and hinges are of gold. Windows of plate glass, shaded by silk curtains, alternate with mirrors in rich frames. The revolving easy chairs and footstools are of silver covered with silk-velvet, and even the inevitable spittoon, no larger than a porcelain button, is perfectly made in silver. On the floor lies a handsome velvet carpet, and at each door the accustomed mat. The ceiling is tastefully frescoed, and tiny but perfect lamps of crystal are suspended thereupon, while the ventilators around the top of the car are minute doors of gold. Looking in at one of the windows you see locked securely in its closet the stove, in silver, which supplies warmth, and in another window you see that the dressing-room with all its appointments is not forgotten. The cost of the toy was £2,600, and its weight is 108 lbs."

Prizes for Improved Cattle Cars in Great Britain.

The *Railway Service Gazette* says:

"The Royal Society for the Prevention of Cruelty to Animals have offered the handsome sum of £400 for improved cattle trucks, and a large number of models have been received and are now to be seen at the Horticultural Gardens in South Kensington. In order, if possible, to mitigate the cruelty to which animals are subjected in railway carriages while in transit, the committee offer a premium of £100 for a new cattle truck; a premium of £100 for alterations or additions to cattle trucks at present in use; and an additional premium of £100 to each successful competitor, so soon as he shall have induced a railway company to build fifty of his improved trucks, and to bring the same into actual use on their line for the transport of cattle. The conditions are as follows:

"The improved truck shall be suitable in gauge, dimensions, construction, material, etc., for the same purposes for which cattle trucks are now used. The truck shall be roofed and provided with spring buffers and axle springs, or other appliances to prevent injuries to animals during shuntings and sudden startings and stoppages; the truck shall be provided with appointments in the carriages for the supply of food and water to animals during the time when the train is in motion, or with suitable arrangements for feeding and watering them when it is stationary at a platform or siding (in which case the contrivance submitted must include the necessary platform or siding appointments), so as to prevent the removal of animals from trucks for refreshment. The cost of the truck shall not be greatly in excess of the cost of cattle trucks now in use, and the trucks shall be satisfactory to the judges.

"In response, fifty-five models have been sent in, of which four have been selected for a final competition."

Spelling the Sign.

A Floyd County farmer halted his team on a crossing to read a large sign stretched across the road. He read: R-a-i-l, rail; r-o-a-d, road, railroad; c-r-o-s, cros; s-i-n-g, crossing, railroad crossing; l-o-o, double o-l, double o-k, look; o-u-t, out; f-o-r, for; look out for; t-h-e, the; e-n, en——" and before he could say g, or even think of a word beginning with it, the end of the world struck his nag amidships; he saw his horse wandering off in different directions into the infinity of space; he was vaguely conscious of snaffle rings and broken tires, and shattered springs and harness things, and fragments of songs like a whirlwind sings, and when he came crashing down on his back and bulged through the top of a freight car and wrecked a job lot of agricultural implements, he would have given all his wagon was worth to know what the rest of that sign was.—*Burlington Hawkeye.*

Fishing For an Engine.

Some weeks ago a Kansas Pacific freight train went through a bridge over the Kiowa River. The river bed there was a quicksand and the engine disappeared entirely. How it was found the Denver *Tribune* tells as follows: "The locomotive which went down in the quicksand at Kiowa, has been discovered by the instrumentality of Wolfe Londoner, who visited the scene of the wreck Sunday. Wolfe went prepared for the work, and with the avowed determination of demonstrating the infallibility of a method his own ingenious brain gave birth to. He procured a metalic rod which he had heavily charged with magnetism. Armed with this he slowly passed over the ground under which, or in the vicinity of which, the engine was supposed to be buried, expecting that the mass of iron in the engine would so attract the magnet that the location of the engine would be easily indicated by the effect on the magnet above. The expectation was realized to the full. The magnet is said to have jumped around so and dived into the sand in such a frantic manner when the current first acted that Londoner and his instrument nearly perished in the quicksand. Col. Fisher was at once apprised of the discovery, and energetic digging and exploration proved that Wolfe had by this simple contrivance accomplished more than the skilled engineers employed on the work had been able to do."

Rail Cutting.

It is a very difficult thing to cut red or nearly white hot rails so that they are of the same length when cold, as, if cut at different temperatares, they will vary in length on cooling. The following ingenious mode of obtaining a standard temperature has been adopted in some German and Russian rail mills. The glowing rails are looked at through a dark glass; when they have cooled to a certain temperature they can no longer be perceived. Using a dark blue or orange-yellow glass, *e. g.*, the rails may still be at a red glow, when the light radiated from them disappears in the dark glass. It may be considered that the light from two rails observed through the same dark glass disappears at the same temperature, and thus one is guided in cutting the rails while in this similar state, each rail after rolling being allowed to cool till it can no longer be seen at a given distance through the dark glass; thus they can all be cut of the same length.

He Was Too Polite.

How hot and dusty it is. How dirty and grimy everybody looks. How cross and unobliging and disgraceful everybody feels. The cars are crowded and everybody is wishing everybody else was out of the way. The woman in front of me has dropped her shawl on the floor. She is not young or handsome, but she is a woman. Her face has a harsh, forbidding expression, but withal, I think I can see tender lines about the mouth. It is a face that has seen trouble. Poor woman, perhaps she has raised 11 children, and now she has them all, with their husbands and wives, to support. No wonder she look tired and worn and repellant. If she was young and pretty as she was thirty years ago, a dozen men would spring forward to snatch her shawl from the dusty floor and bow themselves crooked handing it to her. Now we look at it, and feel too dusty even to tell her where it is. A commercial traveler walks down the aisle and steps carefully over it. A woman goes down the other way and thoughtlessly steps on it. I feel ashamed of myself, and pity the poor, homely woman. With an effort I rise from my seat, I stoop to pick up the neglected shawl.

"Madam," I say, and—oh if my son's mother could see that smile, "Madam, permit me: your shawl—"

I stopped right there. For as I picked up the neglected shawl, out of its voluminous folds fell thumping and rattling to the floor a paper bag, badly fractured, full of crackers, a tin can, some remnants of an ancient lunch, a six inch bologna, bit off at one end, and a bottle of milk, the latter uncorking itself as it fell. The poor neglected woman did not seem to be transported with gratitude for my attention. She snatched the shawl away from me and said, with apparent vexation:

"There now, drat ye; looky at ye, what you've done. Why can't ye mind yer own business and leave other people's things alone!"

A ripple of subdued hilarity passed through the car, and I resumed my seat, fully resolved that if the most extravagantly lovely and loving girl that ever blessed this world of ugly men, should come into that car and her head should fall off her shoulders and drop into my lap, I would kick it savagely out of the window and snarl: "Keep your lumpy old woodeny punkin head out of the way if you don't want it tramped onto."—*Burlington Hawkeye.*

OLD AND NEW ROADS.

Alabama Great Southern.—The London correspondent of the *Commercial and Financial Chronicle* writes as follows, under date of June 22:

"The Alabama Great Southern Railroad Company announces to-day an issue of $850,000 (£168,000) 6 per cent. first-mortgage bonds of $1,000 (£200) each. Interest is

payable in gold Jan. 1 and July 1, at the Farmers' Loan & Trust Company, in New York, the principal being repayable in gold, Jan. 1, 1908. The price of issue is £180 for £200 bond, £10 per bond being payable on application, £30 on allotment, £70 Sept. 1 and £70 Oct. 15. The prospectus says that in order to secure the permanent control and management of the railway in English hands, a company has been registered, under the Companies' Acts of 1862 and 1867, called the 'Alabama Great Southern Railway Company, Limited,' which has taken over the whole interest of the American company, in which the railway is vested by the local law. The share capital consists of £1,722,000, of which £156,600 have been issued in 'A' shares, bearing a preferential dividend of 6 per cent., the whole of which has been subscribed, and was offered in the first instance for subscription to the bondholders of the Alabama & Chattanooga Railroad—who were shut out on the sale of the road by the decree of the Court—and £1,566,000, which have been issued as deferred 'B' shares fully paid up to the subscribers of the 'A' shares, it being the intention of the company to give to the old bondholders an opportunity of retrieving their position under the new organization. The total authorized amount of first-mortgage bonds is $1,750,000 ($350,000), and is secured by a first mortgage to the Farmers' Loan & Trust Company, of New York, of the entire railroad, including its equipment and property of every description."

Atchison, Topeka & Santa Fe.—This company now offers to subscribers, for $900 in cash, nine shares of the capital stock of the New Mexico & Southern Pacific Railroad Company, of the par value of $100 each, and $1,000 in the first-mortgage bonds of the company, each holder of 29 shares of the Atchison, Topeka & Santa Fe Railroad Company's stock being entitled to subscribe for nine shares of said stock; and all subscriptions must be made for $900 or multiples thereof.

Parties who have made subscriptions to the capital stock of this company, under date of March 23, 1878, will be allowed to transfer their subscriptions to the present plan, at their option.

Atlantic & Audubon.—This company has filed articles of incorporation in Iowa to build a railroad from Atlantic, on the Chicago, Rock Island & Pacific, north to Audubon, about 24 miles. The road is to be a branch of the Rock Island, and most of the corporators are connected with that company. It is intended to open a part of its land grant to settlement.

Atlantic & Great Western.—We copied from the *Railway World* a letter giving some account of the origin and early history of this company. In this it was stated that the securities of the company were introduced in London by Messrs. Heseltine, Powell & Co., and other London brokers. The firm named writes to the *World* saying: "This is entirely a mistake as far as concerns our names. We had nothing whatever to do with the inception of the company, and have had but very rarely any transactions in the company's securities throughout the whole period of its existence."

Atlantic, Mississippi & Ohio.—A meeting of bondholders was held in London, England, June 19, at which the committee presented a statement showing what has been done so far. The earnings for the year ending June 30 (May and June partly estimated) were given as follows:

	1877-78.	1867-77.	Inc. or Dec.	P.c.
Gross earnings..	$1,788,031.80	$1,740,838.62	I. $47,193.18	2.7
Expenses.....	1,059,020.02	1,041,733.83	I. 17,286.19	1.7
Net earnings...	$729,011.78	$699,104.79	I. $29,906.99	4.3
Construction and extraordinary renewals	300,448.29	249,849.77	I. 50,598.52	20.3
Balance.....	$428,563.49	$449,255.02	D.$20,691.53	4.6
Gross earn. per mile	4,177.64	4,067.38	I. 110.26	2.7
Net earnings per mile	1,703.30	1,633.42	I. 69.88	4.3
Per ct. of exps..	59.23	59.84	D. 0.61	1.0

The committee has kept steadily in view the importance of a union of interests with the East Tennessee, Virginia & Georgia, when the company is reorganized.

The bondholders approved the report of the committee, and authorized its members to make changes of detail in the plan of reorganization, not to affect its general character and purpose. They also resolved to authorize the Purchasing Committee to fix a limit of time after which no bonds will be received, and to negotiate with parties willing to advance such cash as may be required to complete the purchase of the road. The meeting also approved the appointment as Purchasing Committee of Sir Henry W. Tyler, John Collinson, F. A. Hankey and R. F. Keane.

Mr. Oyens, who was present as representative of the Dutch bondholders, said that they felt bound to oppose the plan of the committee, because the rate of interest on the new bonds was fixed too high, and too much arbitrary power given to the Purchasing Committee.

Central, of New Jersey.—The Drifton Branch of the leased Lehigh & Susquehanna road has been completed and opened for business from Drifton Junction, Luzerne County, Pa., westward through Buck Mountain, Eckley and Jeddo to Drifton, a distance of 11 miles. It brings the road into competition for the business of a part of the anthracite coal-field hitherto served by the Lehigh Valley.

Chesapeake & Ohio.—The following circular from the Receiver, William C. Wickham, is dated July 1:

"By authority of orders of the Circuit Court of the City of Richmond, Va., and of the Circuit Court of Kanawha County, West Virginia, I have this day turned over to the Chesapeake & Ohio Railway Company all the properties, franchises and rights of the Chesapeake & Ohio Railroad Company that came into my hands as Receiver.

"I hereby tender to the officers and employees my thanks for the cordial support which they have giving me heretofore in the management of the Chesapeake & Ohio Railroad, and ask them to extend the same to the management of the Chesapeake & Ohio Railway Company."

Mr. C. P. Huntington, President of the new company (and also of the old) issues the following, bearing the same date:

"1st. The Chesapeake & Ohio Railroad Company having been reorganized under the name of the Chesapeake & Ohio Railway Company, I, as President, assume control of its affairs.

"2d. A. S. Hatch, First Vice-President, with office in the city of New York, will assist the President in conducting the affairs of the company, and in the absence of the President will perform the duties of President.

"3d. Wms. C. Wickham, Second Vice-President, with office in the city of Richmond, Va., will, under my general directions, have the supervision and control of the company at the office in Richmond, and of the operations of the road along its entire line, together with its transportation and passenger business with connecting lines.

"4th. The President, for himself and his associates, makes his acknowledgments to the officers and employés of the old company for the manner in which they have discharged their duties and taken care of the property of the company, and he feels satisfied that they will continue the same vigilant attention to their duties; but he deems it proper to inform them of the absolute necessity of managing every department of the road on the strictest principles of a proper economy and so handling all its business as to produce the largest amount of net money, to enable the company to carry out successfully its plans."

In the Richmond Circuit Court, July 9, a decree was entered ordering the distribution of $159,712.10, part of the proceeds of the sale of this road, among persons entitled to interest on Virginia Central bonds having liens prior to the Chesapeake & Ohio first mortgage.

Chicago, Clinton & Western.—The finished section of 10 miles from Iowa City, Ia., to Elmira has been leased to the Burlington, Cedar Rapids & Northern Company, and will hereafter be known as the Iowa City Branch of that road.

Chicago & Iowa.—On application of some of the stockholders in this company, the United States Circuit Court in Chicago has refused to confirm the sale (which took place March 9), and has ordered a re-sale of the property.

Chicago & Lake Huron.—The Port Huron (Mich.) *Times* says: "At the interview at Lansing, Saturday, between the officers of the Chicago & Northeastern Railroad (now controlled by Vanderbilt) and Receiver Peck, it was arranged that through passenger trains should be run between Port Huron and Valparaiso as usual, but in charge of Chicago & Northeastern employés while on that portion of the road. Local freight business will also be carried on in the same manner. Receiver Peck is obliged to pay such high and arbitrary rates across the Chicago & Northeastern as to preclude the idea of doing a through business, and is engaged to-day in dismantling Western agencies at Indianapolis, Peoria, Milwaukee and other points. The line will probably be worked as local until the road shall be sold and reorganized. Some 300 employés will lose situations by the late action, and are now being discharged and paid off. Rapid progress is being made by Receiver Peck in the settlement of accounts contracted under Mr. Bancroft's administration."

Chicago, Milwaukee & St. Paul.—The track on the extension westward of the Hastings & Dakota Division is now laid to Lake Addie, Minn., 11 miles west from the old terminus at Glencoe, and 85 miles from Hastings. Trains are run through to the new terminus.

Cincinnati & Eastern.—The track is now laid on the extension of this road from its former western terminus at Batavia Junction, on the Little Miami road, west five miles to the line of the Miami Valley road, now under construction. The Miami Valley is to be completed this summer, and the Cincinnati & Eastern is to run into Cincinnati on its track. The main line of the road is now 53 miles long, from the Miami Valley junction to Winchester, O.

Columbus & Gallipolis.—In Columbus, O., July 8, the Court of Common Pleas granted a decree of foreclosure and sale at the suit of Hill & McKechnie, of Chicago, who were contractors for building the road, and hold $276,000 of its first-mortgage bonds, all that have been issued. There is also a considerable floating debt. The road is to run from Columbus, O., southeast to Gallipolis, about 95 miles. It was begun in 1872, but worke stopped in 1873 and was resumed last year. None of it is finished or in operation, though a good deal of work has been done on it.

Connecticut Central.—Surveys have been begun for an extension from Springfield, Mass., by way of Chicopee Falls to Holyoke. The distance is about seven miles, and a bridge over the Connecticut at Holyoke will be required.

Dakota Southern.—A contract for building an extension of 37 miles northward from Portlandville, Ia., on the Sioux City & Pembina Branch of this road, has been let to Thomas M. Nelson, of Fruitport, Mich.

Delphos, Bluffton & Frankfort.—The subscriptions to the stock of this company have reached a sufficient amount to warrant the beginning of work, and contracts were to be let last week for the grading from Bluffton, Ind., southwest to Warren, about 15 miles.

Detroit & Milwaukee.—On July 6 the bondholders represented by A. H. Sibley, Trustee, gave notice of an appeal from the decree of foreclosure as granted by the Circuit Court, This will postpone the sale until the appeal can be heard, which will be at the October term of the Supreme Court.

Duck River Valley.—Meetings are being held to raise the money necessary to secure the extension of this road from Lewisburg, Tenn., southeast to Petersburg, about 18 miles. Contractors have offered to do the work for $30,000 in cash and the balance in bonds, and nearly the required amount has been secured.

Erie.—Receiver Jewett's report for April is as follows:

Balance, April 1	$225,598.76
Receipts	1,947,369.41
Total	$2,172,968.17
Disbursements	2,094,905.05
Balance, May 1	$78,063.12

Receipts included $204,856.89 from loans. The disbursements included $168,945 for interest, $15,153.42 on account of coal lands, and $365,681.20 on account of Receiver's certificates. The amount of certificates outstanding was reduced $129,824.31 during the month.

Gulf, Colorado & Santa Fe.—The loan made by this company is said to be $2,700,000, or $12,000 per mile on 225 miles of road from Galveston to Belton. The bonds are to be taken by English parties at a rate not stated, and are to bear 7 per cent. interest. The contract was to be finally closed this week.

Grinnell & Montezuma.—This road, which has been since its completion worked as a branch of the Central Railroad of Iowa, is now operated by its owners as a separate road. It is 15 miles long, from Montezuma, the county seat of Powesheik County, Ia., northwest to Grinnell, where it connects with the Central and the Rock Island roads. It was built in 1875.

Illinois Central.—This company reports that during the month of June 508.70 acres of land were sold for $3,455. The cash collected on land contracts was $4,205.28. The traffic on the Main Line in Illinois (707 miles) was $406,939 against $386,905.24 in June, 1877, an increase of $20,033.76 or 5.4 per cent. There was also an increase on the Iowa Division of $19,763.33, making the gain on the entire line for the month $39,797.09. In addition to the above the Springfield Division earned in June (as estimated) $14,151. The gain in earnings was in the last week of the month, after good weather set in.

Indianapolis, Bloomington & Western.—A number of the bondholders have formed a corporation under the name of the Indianapolis, Bloomington & Western Railroad Company, the object being to purchase the road at foreclosure sale, and to hasten the sale forward as fast as possible, in order to put a stop to continued useless expenditure and delay. The necessary certificates of incorporation have been filed. The incorporators of the company are: Levi H. Alden, Frank Shepard, Solomon Mead, William J. Elger, J. Augustus Jillson, James Kirkham, John B. Pudney, John C. Short and John W. Kirk.

Indianapolis & St. Louis.—In the United States Circuit Court at Indianapolis, July 6, Thomas A. Scott and H. B. Hurlburt, trustees, filed a bill to foreclose the third mortgage on this road, and asked for the appointment of receivers. The bill states that there is now a floating debt of $200,000, and that the company is unable to pay the July interest on the bonds issued under the mortgage sought to be foreclosed.

Counsel for the trustees named H. B. Hurlburt, one of the trustees, and also President of the Company, and W. C. Quincy as receivers. The Court, however, was not willing to appoint two receivers, and the matter was laid over for further consideration.

The road, which was built in 1870, runs from Indianapolis, Ind., to Terre Haute, 72 miles, and the company leases the St. Louis, Alton & Terre Haute road, extending its line to East St. Louis. It was built as a parallel and competing line to the Terre Haute & Indianapolis, and the Pennsylvania Company owns a controlling interest. There are three mortgages, a first for $2,000,000, a second for $1,000,000 and a third mortgage for $500,000. The road has never earned enough to meet its interest and rental obligations, and it is probable that the present proceedings are intended to secure a reorganization of the company free from burdensome leases and contracts.

Kansas City, Eureka & Santa Fe.—This company has filed articles of incorporation in Kansas. The capital stock is to be $3,500,000; places of business, Kansas City, Mo., and Burlington, Kan.

Kansas Pacific.—The committee representing the Denver Extension bondholders has issued a circular, from which the following are extracts: "No promise or stipulation was ever made or proposed, or could be made, to deposit *all* the outstanding bonds, since, however favorable the proposition might be to the bondholders, some portion might elect not to avail themselves of it, or might be under legal disability, while more or less of the bonds might have been lost or destroyed. Consequently the allegation that 'the Denver Extension bondholders, acting by their committee, are unable to comply with their agreement to deposit with the United States Trust Company, in New York, all the outstanding Denver Extension bonds of the Kansas Pacific Railway Company,' is a pretext for attempting to alter the terms of the arrangement above described.

"The object and purpose of the 'pool' resolution adopted at Lawrence, June 20, 1878, is sufficiently exposed by the memorandum annexed thereto, being nothing else than an attempt to get possession of a portion of the bonds and certificates at 62.4 per cent. of their face value, and to compel the remainder to accept 40 per cent., or whatever sum the road may bring at a sale, forced by the 'pool' by means of deposited bonds. The necessity of prompt and energetic action on the part of the bondholders to protect their rights is apparent. * * * * * *

"To the end that the foreclosure suit may be vigorously prosecuted, it is necessary that the outstanding bonds be collected together without delay. Your committee have made arrangements with the United States Trust Company to receive and keep safe all the bonds, coupons and interest certificates sent in, and to issue certificates therefore without expense to the bondholders. The committee will take steps to give to the certificates so issued all the advantages of negotiability and sale enjoyed by the existing securities. The success of your committee's endeavor to protect the rights and interests of the bondholders depends in great measure upon a general and prompt compliance with this suggestion. Without such coöperation on the part of the bondholders, your committee will feel discharged from further responsibility in the premises.

"Your committee are of the opinion that the action of the 'pool,' as expressed in the resolutions passed at Lawrence, June 20, 1878, was intended to depress the value of the bonds in the market in order to buy them in at less than their real value. We would therefore recommend the bondholders not to sacrifice their bonds under the influence of this action. * * * *

"The road once brought up to a proper standard of efficiency and completeness, the prospects of bondholders are encouraging, even in the face of all obstacles which the Union Pacific or any other opposing or competing interest can place in our way.

"It would seem proper that, on the surrender of a majority of the Denver Extension bonds to the Trust Company, as herein suggested, a meeting be called of the depositing bondholders for the purpose of appointing a committee who shall draw up a plan of reorganization and submit the same to a subsequent meeting at which a purchasing or reorganization committee shall be appointed, at whose disposal the bonds in the Trust Company shall for all purposes of foreclosure and reorganization be placed. The expenses of every nature and kind, including those of the Trust Company, to be paid by the reorganized company.

"We, therefore, request you to send your bonds and coupon certificates to the United States Trust Company, No. 49 Wall street, N. Y., and the proper receipts will be given therefor."

Massachusetts Central.—Nearly all the towns holding stock in this company have now voted to put their stock in the hands of a trustee, with authority to transfer three-fourths of the amount to the Treasurer of the company, provided the road is finished and in good running order within two years. A meeting will soon be held to select the trustee. In some of the towns there was much opposition, but the final conclusion was that the stock is utterly worthless now, and it was better to give up a part with the hope of getting something out of the rest.

Metropolitan Elevated.—This company has executed a mortgage to secure an issue of bonds at the rate of $600,000 per mile, the bonds to run 30 years and bear 6 per cent. interest. The mortgage is dated July 10, 1878, and is made to the Central Trust Company, of New York, as trustee.

In the suit brought by the New England Iron Company to recover damages for alleged breach of contract, the New York Supreme Court has refused to grant an order for the examination of the company's books.

Minneapolis & St. Louis.—Iowa papers report that surveys are being made for an extension of this road from Albert Lea, Minn., southwest to Fort Dodge, Ia., about 80 miles. It is said that the company is willing to build the road at once, if sufficient local aid is offered.

Montreal, Portland & Boston.—A Montreal dispatch says: "The cars on this road are again running as far as St. Hubert crossing, three miles from St. Lambert, Quebec. The cars on the track of the St. Lambert end of the road have been placed there, it is said, by the Grand Trunk Company to obstruct the line, until such time as a claim they have on it is settled. The Montreal, Portland & Boston Company assert that they can produce a written agreement made

with the late Manager of the Grand Trunk Railroad Company, Mr. Brydges, giving said company the right of way on the section now blocked up, provided they did not cross the Grand Trunk Railroad and connect with the St. Lambert ferry-boat."

Northern Pacific.—This company reports for June sales of 94,580 acres of land for $418,168. The business of the road for the month was also very large.

Oxford & Henderson.—Surveys have been completed for this road, from Oxford, N. C., eastward to the Raleigh & Gaston, at Henderson. The distance is 12¾ miles, and the estimated cost for a narrow-gauge road with 30-lbs. rails, two engines and six cars is $65,000, or a little over $5,000 per mile.

Peterboro & Hillsboro.—The last rail on this road was laid at Peterboro, N. H., July 4, with due ceremony. The road has been in progress for some time and was built under a charter granted 30 years ago. It extends from the terminus of the Monadnock Railroad at Peterboro northward to Hillsboro Bridge, the terminus of a branch of the Concord & Claremont road, and is 18 miles long. In connection with the Boston, Barre & Gardner and Monadnock roads to the southward and the Concord & Claremont on the north, it completes a new line 98 miles long from Concord to Worcester, which is expected to command a fair traffic in business to the west and to New York from Concord and the roads above that city. Some subscriptions were made by the towns interested, but most of the cost of the road has been advanced by connecting lines, the Northern (New Hampshire) and the Boston, Barre & Gardner aiding the road to a considerable amount.

Pittsburgh & Lake Erie.—Track is now laid to Beaver Falls, Pa., 30 miles southeast from Youngstown, O., and 12 miles beyond the late terminus at Mahoningtown. The road was opened for traffic July 3, when an excursion train ran from Youngstown to Beaver Falls and return.

Portland & Ogdensburg.—After three years' discussion, the New Hampshire Legislature has passed the act authorizing this company to change the location of its road, and to build from Fabyan to Dalton on what is known as the northern route. The distance by this location is 17 miles. The company has been for some time using the Boston, Concord & Montreal track between the two points.

Richmond, Fredericksburg & Potomac.—At a special meeting of stockholders in Richmond, Va., recently, resolutions were passed directing the officers of the company to contract with the Potomac Steamboat Company for the reëstablishment of the day steamboat line between Quantico and Washington, the steamboats to receive the same proportion of the through passenger rate as is now paid to the Alexandria & Fredericksburg road.

This was bitterly opposed by some of the stockholders, and they threaten legal proceedings to prevent the completion of the contract, holding that in this matter the interests of the company are subordinated to those of the steamboat company.

St. Joseph Bridge. –On July 2 the eastern span of the bridge over the Missouri at St. Joseph fell into the river, the abutment having been undermined by the current so that it slid from its place. The western end of the span remained on the pier, the other end resting on the river bottom. The span was a short one, 80 feet long, and, it is thought, is not greatly damaged, but the cost of replacing the abutment will be considerable. The abutment had been considered in danger, and a train had been at work hauling stone to be thrown in to break the force of the current,

St. Louis, Alton & Terre Haute.—As expected, the note given by the Indianapolis & St. Louis Company for $37,500, the April rental of this road, was allowed to go to protest July 3 by the lessee and the guarantors. The company will, it is said, begin legal proceedings to enforce payment of the rent.

St. Louis & Southeastern.—Auditor E. Young's report for May is as follows:

	St. L. Div.	Ken. Div.	Tenn. Div.	Entire line.
Earnings	$45,843.63	$28,972.22	$17,890.01	$92,705.86
Expenses	37,453.55	25,672.40	10,135.27	73,261.22
Net earnings	$8,390.08	$3,299.82	$7,754.74	$19,444.64
Per cent. of exps	81.78	88.53	56.62	79.03

As compared with May, 1877, the entire line shows an increase of $12,895.86, or 16.2 per cent., in gross, and of $14,646.81, or 305.1 per cent., in net earnings.

South Carolina.—In Charleston last week the United States Circuit Court granted an order to this company to show cause why a receiver should not be appointed. The order was granted on application of the bondholders, and is returnable at the September term.

Southern Minnesota.—This road was completed and opened for business July 1 to Fairmont, in Martin County, Minn., 18 miles west by south from the former terminus at Winnebago. This extension is through a very good country now filling up rapidly with settlers. It has been built by a separate company, the Southern Minnesota Extension, which is controlled by the Southern Minnesota, and that company will operate the road.

Springville & Sardinia.—The board of Directors has finally agreed upon the location of the road, and has ordered an assessment of 10 per cent. upon the stock subscriptions for the purpose of beginning work. It has also resolved to solicit proposals for building the road. The line is from Springville, Erie County, N. Y., east by north to the Buffalo, New York & Philadelphia in the town of Sardinia. The distance is about 13 miles.

Toledo & Southwestern.—This company is now securing the right of way for its projected narrow-gauge road from Toledo, O., southwest to Dupont, where it is to connect with the Toledo, Delphos & Indianapolis. The distance is 34 miles.

Utica & Black River.—The rails are now all laid on the extension of this road from Morristown, N. Y., northeast to Ogdensburg. The new road is 10.6 miles long, running parallel to the St. Lawrence River, and required some heavy work, including a long rock cutting. This extension gives the road a better terminus on the St. Lawrence, with the additional advantage that the transfer across the river at Ogdensburg is always open, while that at Morristown is frequently blocked by ice. The company now has 181 miles of road, as follows: Utica to Ogdensburg, 135; Carthage to Sackett's Harbor, 30, and Clayton to Theresa, 16 miles. The buildings at Ogdensburg are nearly finished; they are a passenger depot, freight house and round-house, all of stone.

Worthington & Sioux Falls.—Trains on this road now run to Valley Springs, Dakota, six miles westward from the old terminus at Beaver Falls, Minn., and 48 miles from the junction with the Sioux City & St. Paul at Worthington. The road is controlled and worked by the Sioux City & St. Paul and the St. Paul & Sioux City companies.

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Ogdensburg & Lake Champlain.

This company owns a line from Ogdensburg, N. Y., to Rouse's Point, 122 miles. It was for several years worked by the Central Vermont under contract, but last year the company succeeded in recovering possession of its property. The present report is for the year ending March 31, 1878.

It is equipped with 32 engines, 17 passenger-train cars and 1,003 freight cars.

The general account is as follows:

Common stock		$3,077,000.00
Preferred stock		2,000,000.00
Total stock ($41,615 per mile)		$5,077,000.00
Bonds ($8,303 per mile)		1,013,000.00
Bills payable, accounts, etc		133,998.08
Profit and loss		110,198.01
Total ($51,920 per mile)		$6,334,196.09
Cost of road ($46,535 per mile)	$5,677,000.00	
Sinking-fund bonds issued to Central Vermont	394,000.00	
Materials, cash, other assets	263,196.09	
		6,334,196.09

The earnings for the year were as follows, no comparison being made with the previous year, when the road was not in the hands of the company:

Freight, storage, etc		$467,550.63
Passengers		102,029.61
Express and mail		16,532.70
Rents		12,139.74
Total ($4,903.71 per mile)		$598,252.68
Expenses (56.84 per cent.)		340,076.38
Net earnings ($2,116.20 per cent.)		$358,176.30
Dividends on preferred stock	$160,000.00	
Interest on bonds	73,997.37	
		233,997.37
Surplus		$124,178.93
Surplus from previous year		31,695.36
Real estate sold		28,311.45
Bonds sold		100,000.00
Total		$184,185.74
Back taxes, etc	$13,610.01	
Legal expenses, etc	14,214.94	
Extraordinary repairs	46,162.78	
		73,987.73
Surplus at close of year		$110 198.01

The extraordinary repairs were made necessary by the bad condition of the road when surrendered. The gross earnings were reduced by low rates on through business, but the expenses were kept down by close economy. Local freight furnished 59.4 per cent. of the freight earnings. Negotiations are in progress for a through line in connection with the Rome, Watertown & Ogdensburg. The report says: "We have now two lines connecting Ogdensburg with Lake Erie and Lake Michigan points, viz.: The Northern Transit Company, with their steamers *via* the Welland Canal, and the Collingwood line, so called, by water to Toronto, thence by rail to Collingwood, and from there by water to Chicago and Milwaukee. The improvements to the Welland Canal have made rapid progress the past winter, and it is expected that the widening and deepening will be completed early in the spring of 1879. These improvements are of great value and importance to us, as we shall no longer be depending for our through business upon vessels of from three to four hundred tons' capacity; the largest class of steamers on the lakes will then come to our docks at Ogdensburg, and the volume of our business will be largely increased."

There were put in the track 500 tons of steel and 750 tons of iron rails, and 2,000 tons of steel have been contracted for, to be used during the current year. Large renewals will be required for several years. Much work must also be done on the bridges, which have been neglected.

The total expenses of the recovery of the road, including repairs to make good the lessee's neglect, have been $116,172.54, or $16,172.54 more than the bonds issued for the purpose.

During the past year the directors have authorized an issue of $600,000 of bonds, bearing interest at 6 per cent. per annum, secured by a mortgage of the road and property, to pay the equipment bonds of $300,000, due January, 1878, and $200,000 due January, 1879. The remaining $100,000 is to reimburse the company for expenses incurred in obtaining possession of the road from the Central Vermont Railroad Company. Four hundred and forty-six thousand dollars of these bonds have been negotiated at par, and the proceeds applied as provided by the mortgage; the remaining $154,000 will be sold and applied to payment of outstanding bonds, due January, 1879.

Pensacola & Perdido.

This company, which owns a line nine miles long, from Pensacola, Fla., to Perdido, issues its report for the year ending March 31, 1878, in the following concise form:

RECEIPTS.

Passenger receipts		$1,744.60
Freight receipts		46,535.86
Receipts for dock dues and ballast		1,151.84
Bills payable outstanding March 31, 1878	$34,613.88	
Individual liabilities, March 31, 1878	3,018.54	
	$37,632.42	
Bills payable March 31, 1877	$16,489.15	
Individual liabilities	11,315.99	
	27,805.13	
		9,827.29
		$59,289.59

DISBURSEMENTS.

Office expenses, stationery and printing		$197.45
Contingent exepenses, taxes, attorney's fees, etc		3,146.30
Salaries account		3,431.00
Repairs to locomotives		1,847.72
Repairs to cars		408.04
Movement		10,498.47
Track repairs		4,653.78
Wharf repairs		2,283.20
Damages paid		5.00
Car rent		827.61
Construction account, extending wharf, switches, etc		2,689.45
Equipment account, new cars, lathe, etc		5,486.37
Interest account		14,179.99
Sinking fund		4,220 00
Collection account, March 31, 1878	$8,237.78	
" " " " 1877	2,822.57	
Increase		5,415.21
		$59,288.59

Vicksburg & Meridian.

This company owns a line from Vicksburg, Miss., eastward to Meridian, 140 miles. There is also an extension 2 miles long from the depot in Vicksburg to the wharves on the Mississippi River. The 17th annual report of the company covers the year ending Feb. 28, 1878.

The equipment consists of 17 engines; 8 passenger, 2 sleeping, 2 smoking and 3 baggage cars; 58 box and 37 flat cars. Two engines were built and one bought during the year. Many of the cars are old and the necessities of the road keep them in constant service, so that some additions are much needed.

The balance sheet is as follows:

Common stock		$357,407.69
Preferred stock		1,036,378.60
Total stock ($9,815 per mile)		$1,393,786.29
Funded debt ($22,307 per mile)		3,167,643.31
Bills payable		77,143.15
Land scrip		1,848.51
Total ($32,679 per mile)		$4,640,421.26
Road and equipment ($21,769 per mile)	$3,046,443.88	
Mississippi River extension and landing	133,392.87	
Extension tonnage dues	42,952.00	
Bills receivable	33,899.49	
Profit and loss	1,383,733.02	
		$4,640,421.26

There are $80,000 bonds in the sinking funds. The floating debt decreased $21,933.50 during the year. The company has a considerable land grant, from which 2,120 acres were sold for $2,670 during the year.

The work done was as follows:

Train mileage:	1877–78.	1876–77.	Inc. or Dec.	P.c.
Passenger	112,063	.....	... ...	..
Freight	102,251	.....	.....	...
Service	43,970	.....	.....	...
Switching	9,800	.....	.....	...
Total	268,084	250,143	I. 17,941	7.2
Passengers carried	61,317	57,676	I. 3,641	6.3
Passenger mileage	2,275,135	2,389,152	D.114,017	4.8
Tons freight carried	61,519	49,461	I. 12,058	24.4
Rate per pass. per mile	5.80 cts.	5.70 cts.	I. 0.10 ct.	1.8
Rate per ton per mile	3.25 "	3.73 "	D. 0.48 "	12.9
Cost of engine service per mile	15.10 "	.....	.....	...

Cotton carried for the year was 78,638 bales, a decrease of 3,238 bales, or 4 per cent. from the previous year.

The earnings of the road for the year were as follows:

	1877–78.	1876–77.	Inc. or Dec.	P.c.
Passengers	$132,076.08	$136,304.72	D. $4,228.64	3.1
Freight	280,080.07	254,308.97	I. 25,771.10	10.1
Mails, etc	18,272.46	21,071.36	D. 2,798.90	13.3
Total	$430,428.61	$411,685.05	I. $18,743.56	4.6
Expenses	307,064.24	305,855.16	I. 1,209.08	0.4
Net earnings	$123,364.37	$105,829.89	I. $17,534.48	16.6
Gross earn. per mile	3,031.19	2,899.19	I. 132.00	4.6
Net " " "	868.76	744.51	I. 124.25	16.6
Per cent. of exps	71.34	74.29	D. 2.95	4.0

During the year 500 tons of steel rails were laid, and 1,020 old iron rails repaired and relaid; 53,508 new ties were laid and some ballasting done. Full repairs were made on the wooden bridges. The work on the road has been somewhat restricted by scarcity of cars.

The business showed an improvement, and is expected to increase, owing to improvement in connections and gradual, but continued increase in settlement along the line. The property has not been allowed to depreciate, but has rather been improved.

Southern Minnesota.

This road extends from Grand Crossing, Minn., on the Mississippi, opposite La Crosse, Wis., westward to Winnebago, 170 miles. Its trains run over the Chicago, Milwaukee & St. Paul track and bridge from Grand Crossing to La Crosse. The report is for the year ending Dec. 31.

The equipment consists of 14 engines; 3 passenger, 3 combination and 3 mail and express cars; 197 box, 83 flat and coal, and 9 caboose cars; 1 tool and 1 pile-driver car.

The land department reports sales for the year of 721.17 acres for $5,549.50, leaving 154,408.61 acres unsold.

The work of the year was as follows:

Train mileage:	1877.	1876.	Inc. or Dec.	P. c.
Passenger	109,800	107,023	I. 2,777	2.6
Freight	161,784	171,556	D. 9,772	5.7
Service	23,739	33,727	D. 9,988	29.6
Switching	19,353	25,309	D. 5,956	23.5
Total	314,676	337,615	D. 22,939	6.8
Passengers carried	58,013	54,098	I. 3,915	7.2
Tons freight carried	178,182	178,259	D. 77	....
Av. No. loaded freight cars per train	15.08	14.62	I. 0.46	3.1
Cost of locomotives per mile	23.3 cts.	26.0 cts.	D. 2.7 cts.	10.4

The proportion of empty to loaded cars was 1 to 1.97 on west-bound, and 1 to 5.17 on east-bound trains; three empty cars are counted as two loaded ones. Of the freight carried 47.36 per cent. was wheat, 14.95 per cent. flour, 20.63 per cent. lumber and forest products, and 1.36 per cent. grain other than wheat.

The earnings for the year were as follows:

	1877.	1876.	Inc. or Dec.	P. c.
Freight	$559,687.35	$511,903.93	I. $47,783.42	9.3
Passengers	98,330.97	90,593.47	I. 7,737.50	8.5
Mail and express	18,840.00	19,415.91	D. 575.91	3.0
Miscellaneous	10,204.80	14,927.90	D. 4,723.10	31.7
Total	$687,063.12	$636,841.21	I. $50,221.91	7.9
Expenses	390,796.97	413,197.28	D. 22,400.31	5.4
Net earnings	$296,266.15	$223,643.93	I. $72,622.22	32.5
Gross earn. per mile	4,041.55	3,746.12	I. 295.43	7.9
Net earn. per mile	1,742.74	1,315.55	I. 427.19	32.5
Per cent. of exps	56.89	64.88	D. 7.99	12.3

Earnings for the first half of the year were light, owing to the grasshoppers and light crops, but in the last half they increased very largely, especially in the last four months.

The income account was as follows:

Balance, Dec. 31, 1876		$96,609.95
Net earnings		296,266.15
Loss and gain		373.00
Total		$396,249.10
Right of way claims	$3,812.59	
Purchase of shops at Hokah	30,000.00	
Land trust certificates	40,915.37	
Old claims, judgments, etc	15,707.52	
Reorganization expenses, 3½ years	35,604.73	
Interest on mortgage debt	248,289.72	
		374,329.93
Balance, Dec. 31, 1877		$21,919.17

The floating liabilities at the close of the year were $65,511.11; floating assets, $87,430.28; balance of assets, $21,919.17.

Unusual expenditures were made for renewals and repairs. There were 3.12 miles of track laid with steel and 8.53 miles with iron rails, and 131,755 new ties put in. A new iron bridge, 134 feet long, was built to replace a wooden one, 1,910 feet of pile bridging renewed and other bridges repaired. There were 225 feet of trestle filled in, and other necessary work done. Some 3,600 feet new sidings were laid and 3,925 feet unnecessary sidings taken up. Several depots and stock yards were built and 6.8 miles new fence put up.

The boat transfer to La Crosse has been finally given up, and all trains now use the Chicago, Milwaukee & St. Paul bridge, the transfer being made on very favorable terms.